RUBBER and PLASTICS WEEKLY

VOLUME 141 NO. 9 AUGUST 26 1961 ONE SHILLING

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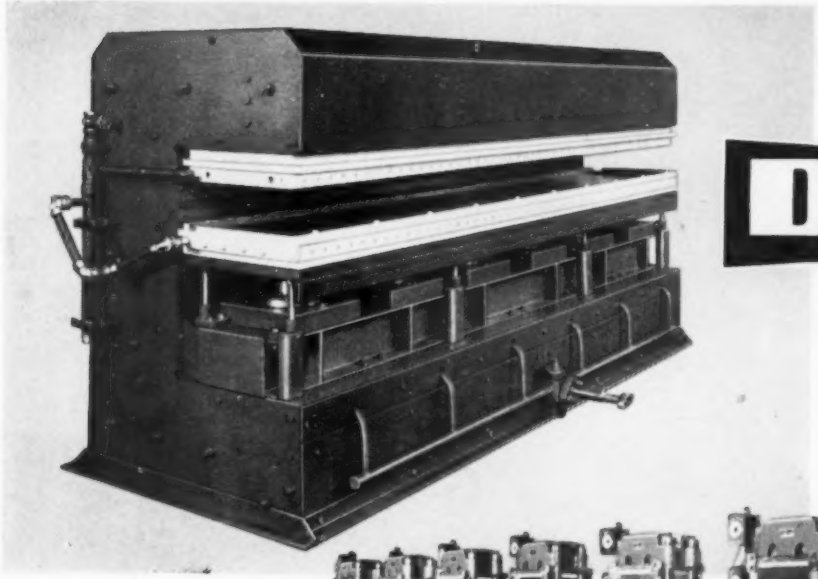
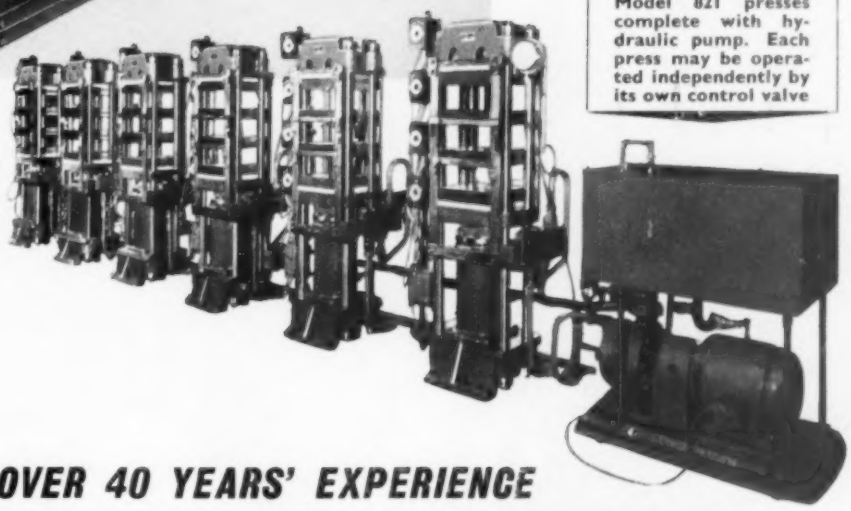


(Above) Model 838. Open-fronted press, one daylight, steam heated. Total pressure 150 tons.



(Below) A self-contained unit comprising six 3 daylight electrically heated 38 ton Model 821 presses complete with hydraulic pump. Each press may be operated independently by its own control valve

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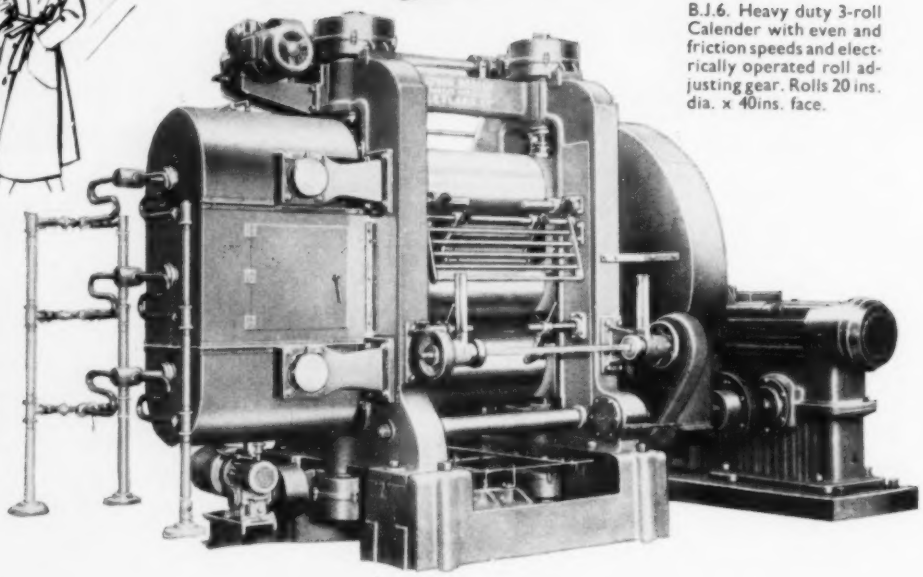
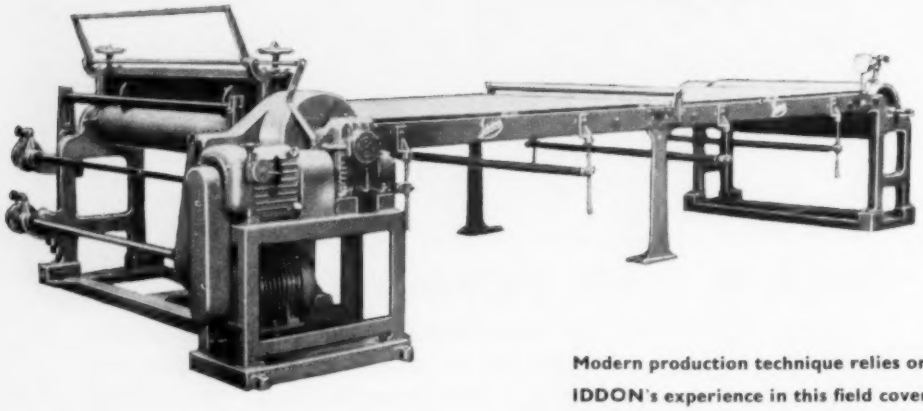


B.J.6. Heavy duty 3-roll Calender with even and friction speeds and electrically operated roll adjusting gear. Rolls 20 ins. dia. x 40ins. face.



BZ.12. Spreading machine with variable speed drive unit.

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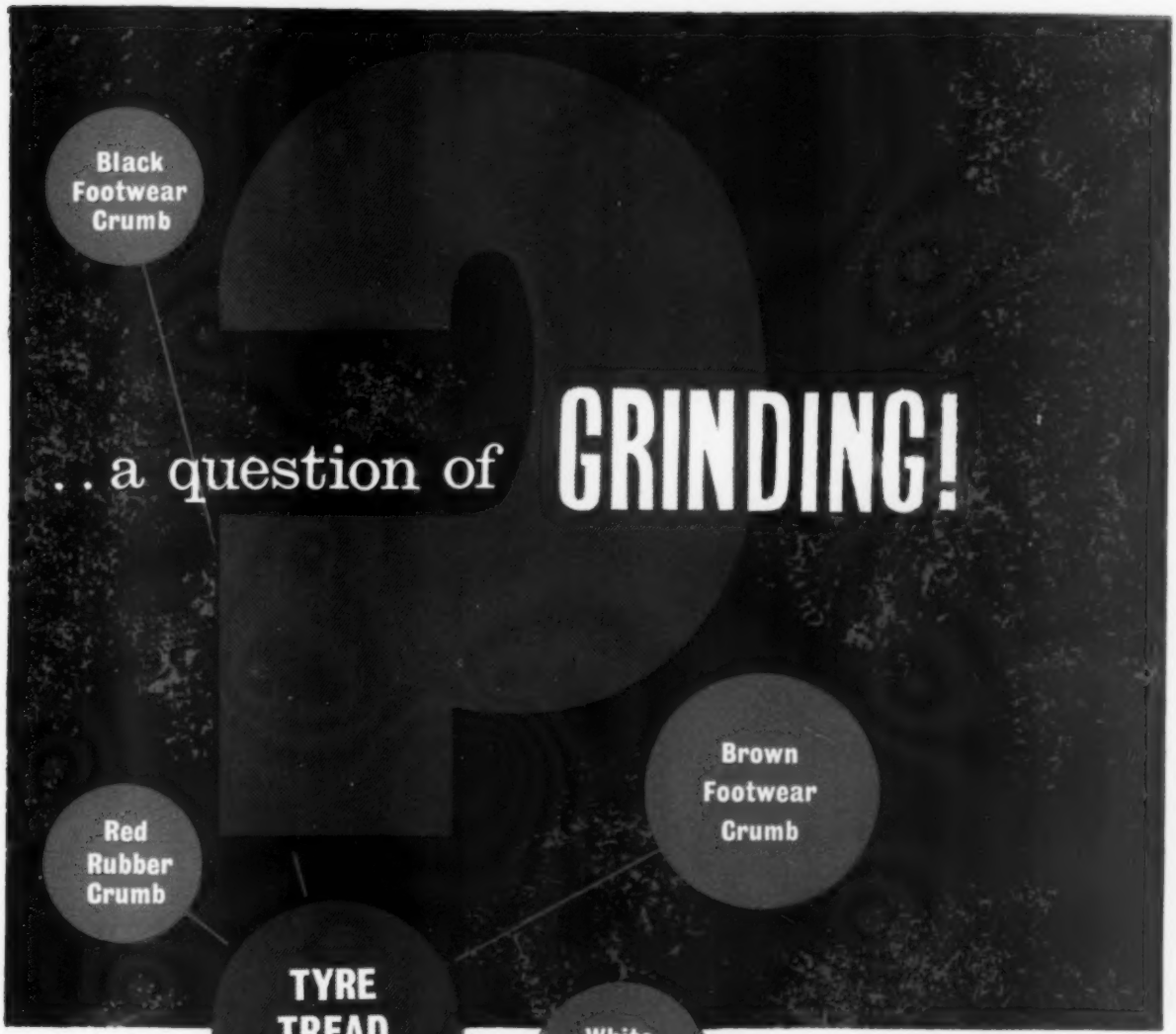

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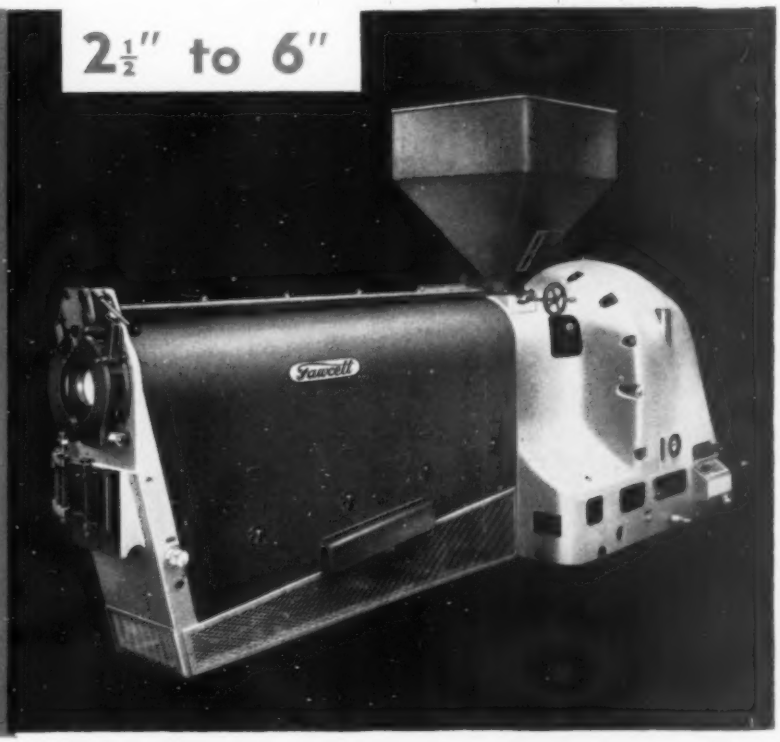

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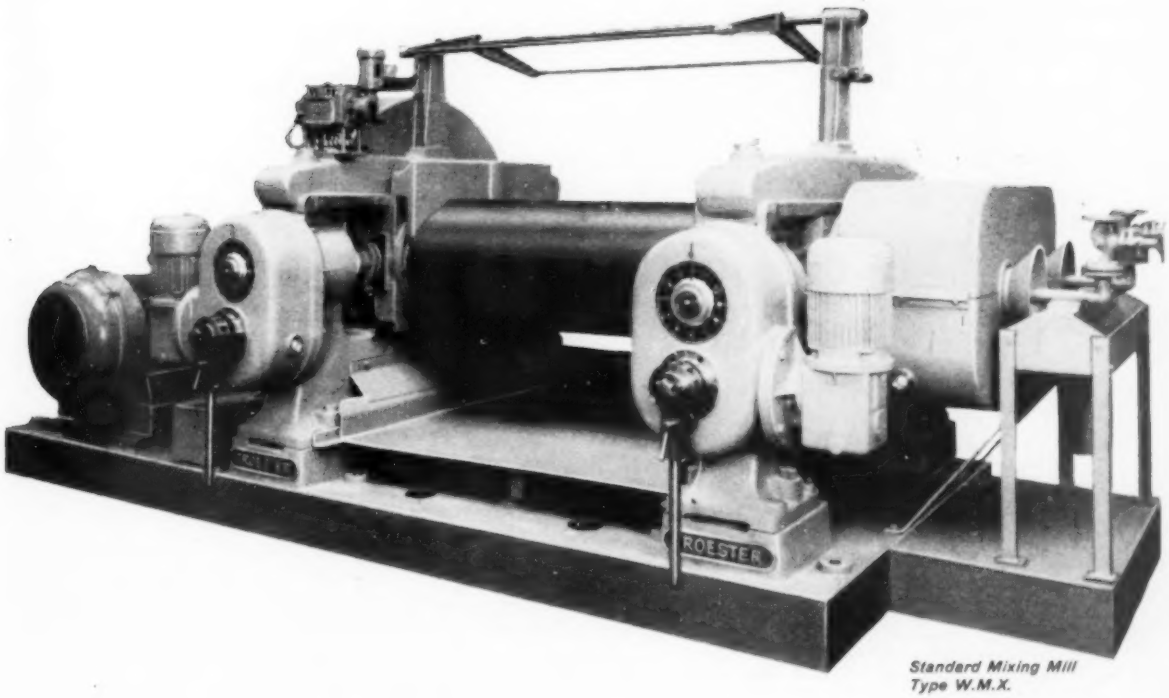

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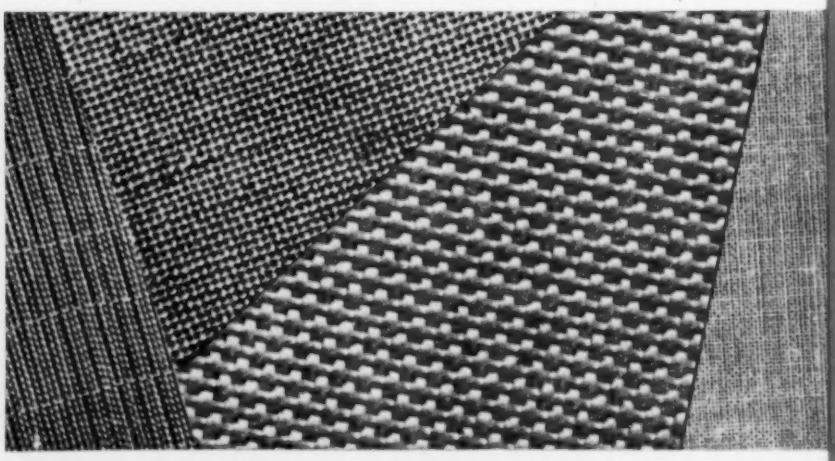

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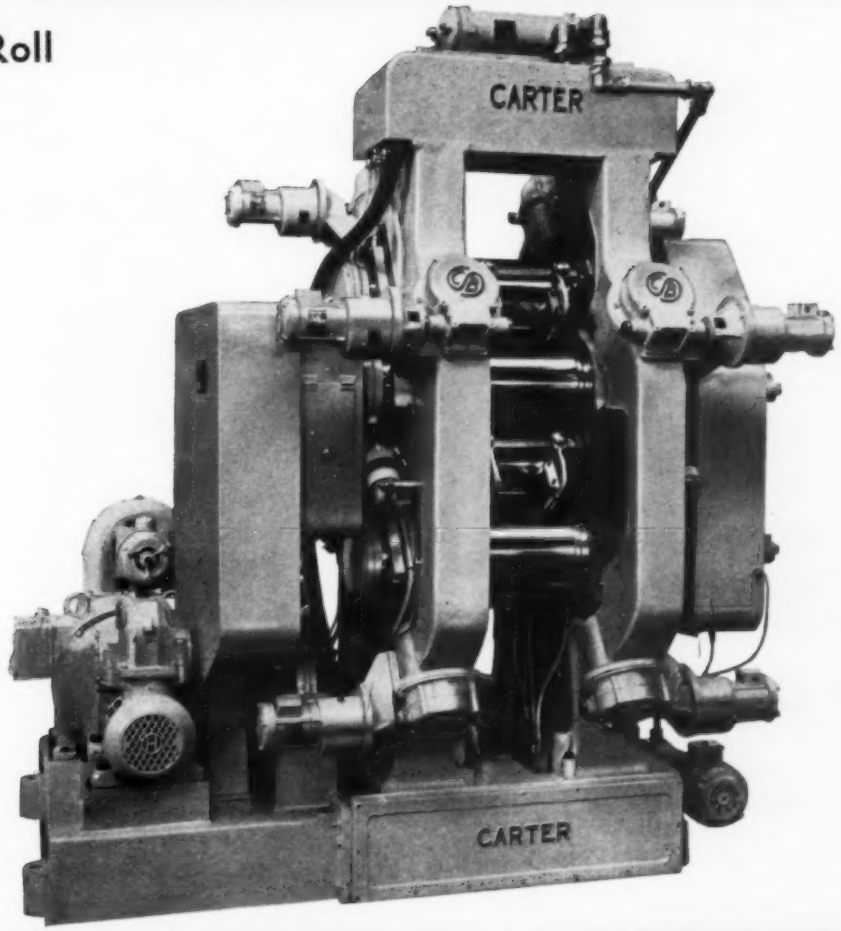

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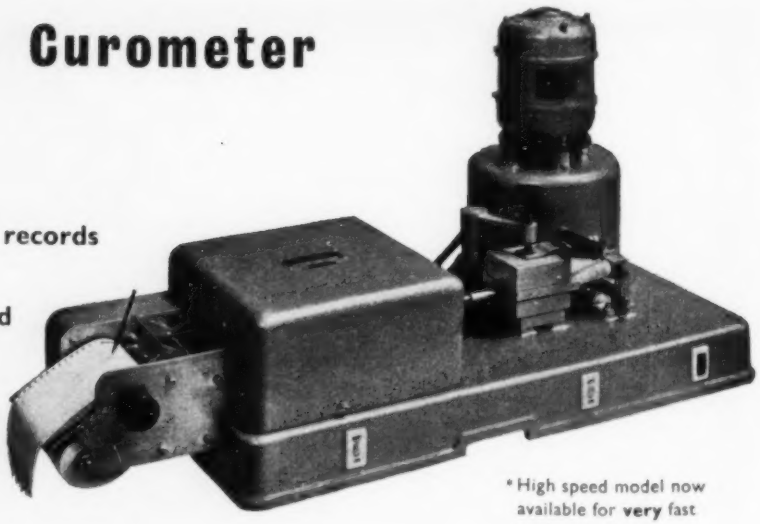

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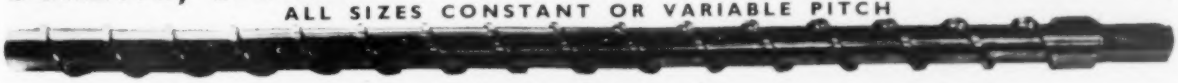

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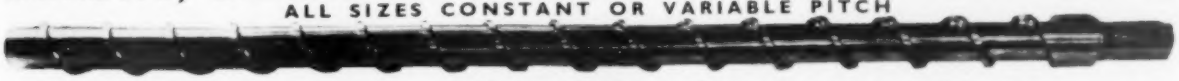

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NOTES of the WEEK

Motivating Exports

MOTIVATIONAL research has now been applied to find out the attitude of small and medium-size firms towards exports. Whatever may be our feelings about 'depth interviews' and the application of social psychology to business, the results of a recent pilot survey carried out on behalf of the Export Action Now Committee of the Institute of Directors are very interesting. The survey was confined to firms having not more than 300 employees. Interviewers worked to no set questionnaire, so that the people being interviewed could, in theory, talk quite freely. Their answers were not taken solely at their face value, but 'the skills of social psychology were used in order to assess the nature and significance of underlying attitudes and prejudices'.

In spite of this rather dubious extension of interpretation, the pages of the survey do bear out one of its main conclusions. This is that, in the overwhelming majority of cases, the failure of the UK manufacturer to increase, or even maintain his exports, or to move into the export market at all, is a function not of any external circumstance but of his general attitude towards exports. It is not that he *cannot* export, but simply that he does not want to.

More Practical Assistance

THERE are various reasons given for this, ranging from comparatively trivial ones such as language problems and difficulties with forms, to the financial risk involved and the prosperity in the home market. Two manufacturers' comments expressing the last reason, quoted in the survey are: 'I am kept 100% busy with UK trade, so why should I go to the trouble of exporting? It would not be worth the effort'. And: 'If ever I were in the position of not having enough trade in the home market, I would probably consider exporting, and finding my way about this market to avoid selling at less profit'. This attitude seems to discount the fact that any slump in UK demand would probably be the result of a global trade recession — which might well close up the possibility of exports.

A good deal of the criticism against small and medium-sized manufacturers in the export field may be justified. But the essential fact remains that a firm is in business to make money in the best and most efficient way it considers possible. If there was more practical assistance and less exhortation from the Government, there would be more response. Is the export ball in the manufacturers' court or the Government's? We feel that if Selwyn Lloyd made some small tax concession on the proportion of a firm's turnover that was exported, then this would do far more good than a thousand after-dinner speeches by the President of the Board of Trade urging manufacturers to export more. Only in taking a practical step like this can the natural self-interest of the manufacturer be linked with the long-term interests of the national economy.

Trained Training

NOT only in terms of exports, but in terms of general productivity we need more skilled workers. The much-publicized 'bulge' will provide the quantity — but not necessarily the quality. The recent report of the Industrial Training Council (its second) shows that it is still 'far from satisfied' that all industrial organisations are taking their responsibilities for training apprentices sufficiently seriously. Educational and training schemes generally within the rubber and plastics industries stand comparison with those of other industries, thanks to a great deal of hard work put in both by organizations and by individual firms. At the same time as the Industrial Training Council's report was published, for example, a new apprentice school was being opened by Permali Ltd., at its Gloucester works. This school, like others, will overcome many of the difficulties that result from training an apprentice by attaching him to one production department all the time. Schools of this type recognize the simple fact that is so often overlooked — for training people you need men who are themselves trained to teach. This is particularly the case with apprentices. A boy who has just left school is used to being taught in a fairly disciplined and logical manner. Continue this process and the chances are that a first-class employee will be the result. Subject him to haphazard training and the result will be a haphazard workman.

Feedback

SO much of the rubber and plastics industry is now tied up with petrochemicals that there will be much of interest for us at the second Chemical and Petroleum Engineering Exhibition, to be held at Olympia next year (June 20-30). The world's consumption of petroleum products doubles itself every 12 years, and more than £120m. worth of petroleum equipment is made in the UK every year. From our point of view not the least interesting thing will be the growing prospects for the plastics industry to sell to the hand that feeds it — as recent projects to produce oil pipes in such materials as GRP and acetal resin have shown.

NEWS *Briefs*

NR EDGES UPWARD — ACETAL FOR OIL PIPES
DUNLOP TALKS IN NIGERIA — HOECHST ISSUE
US RUBBER STRIKE — NEW POLYETHER RANGE

●**United States** — A new line of polyethers has been introduced by Allied Chemical International. Called Actol, they are being sold in commercial quantities, following the start-up of Allied's new 20m. lb. a year plant at Baton Rouge, Louisiana, USA. The first two polyethers to be marketed are Actol diol 21-56 and Actol triol 31-56, said to be specially tailored to meet the needs of the urethane industry for flexible foams of consistent quality. Most of the 70-80m. lb. of polyethers made in USA this year will go into flexible urethane foam for furniture, bedding and car upholstery. Smaller, but fast-growing polyether markets exist for rigid urethane foam for thermal insulation, and marine flotation applications.

●**France** — Etablissements Kuhlmann of Paris and E. I. du Pont de Nemours and Co. of Wilmington, Delaware, USA, are to form a new French company to manufacture and sell isocyanates. Each company will own 50% of the stock of the new company, to be called Dekachimie, and capitalization will amount to NF30m. Dekachimie will build a plant near Lille at Etablissements Kuhlmann's existing La Madeleine facility. Construction will begin early next year and the plant will be completed in 1963. Meanwhile, isocyanates from USA will continue being sold in the European market by the new company.

●**West Germany** — A prospectus was issued on Monday (August 21) for the sale by Farbwerke Hoechst of DM7m. of new shares. The issue is to facilitate the introduction of the company's shares on foreign stock exchanges, and increases the issued capital to DM700m.

●**United States** — Full-scale operations of Packaging Frontiers Inc., producers of the Ultra-Pak tetrahedron packaging system, will begin soon. The company has announced completion of its new headquarters building at Waltham, Mass.

●**Holland** — A £200,000 plant is being constructed at Schoonebeek, in north-east Holland for the production of monomeric and polymeric plasticizers, by Scado Archer Daniels. The company already manufactures plasticizers at Zwolle and is said to be about to establish a subsidiary with its own plant in Malmö, Sweden. The US concern Archer Daniels Midland has an interest in the company.

●**United States** — More than 1,800 United States Rubber Co. workers went on strike at Passaic, New Jersey, on August 16. They struck when a new contract was not negotiated. Informed sources said that an incentive plan was the main issue in the dispute. The plant makes industrial rubber products.

●**Rhodesia** — At Kitwe, in Northern Rhodesia, the range of lines from the rubber products factory of Pigott Maskew (Rhod.) Ltd., is to be extended, with emphasis on the requirements of the copper mines, according to a report from Barclays Bank DCO. At present the factory produces rubber linings and mouldings. In Lusaka a factory has been established by Lusaka Plastics Ltd., to meet local demands for pvc and polythene extrusions.

●**Singapore** — On Tuesday (August 22) the price of RSS 1 on the Singapore market closed at 87½ Malayan cents a lb. — 1 cent above the previous close and the highest price since May 31. The Berlin situation was stated by traders to be the main reason for the upward tendency. (Full market prices — page 336.)

●**United States** — Du Pont is doubling polythene film capacity at its Richmond, Virginia, plant. When new extensions come on stream in the middle of 1962, it is reported that the plant will have a capacity of 60m. lb. a year. The company has also announced plans to construct a plant at Tulsa for the manufacture of oil field piping from its Delrin acetal resin. This plant should also be completed in the middle of 1962 and capacity is rated at 5m. lb. a year.

●**Nigeria** — Discussions started in Lagos on Monday (August 21) between Dunlop Rubber Co. Ltd. and the Federal Minister of Finance on whether the Government will take part in the projected tyre plant at Ikeja. This would be a £2m. plant, and would manufacture car, truck and bicycle tyres. Production would commence by the end of next year.

'What hardness reading do you want — Shore, British Standard or Common Market?'—551

New Dixon Cutting Machine

DEVELOPED FOR CONVERTORS OF PLASTICS SHEET

T. H. DIXON and Co. Ltd., the Letchworth engineering firm, announced this week that it had completed development work on an entirely new machine for the plastics industry. This is the model 419 cutting machine.

For several years the firm has been selling its model 537 slitting machine to convertors of plastics sheeting. Dixon says that it has felt the need for a machine which will complement this slitter by providing a means of cutting the reels out into sheets. Model 419 has been developed to do this.

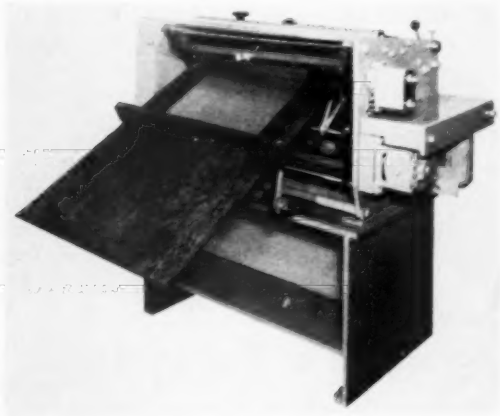
The machine will take rolls up to 25in. wide and 12in. diameter and cut them into sheets of any length up to 30in. long. A slitting attachment can be fitted which will eliminate a further operation where narrow widths of material are required.

Cut-off length is accurately controlled by a 'one-way' clutch, driven by an adjustable quadrant on the side of the machine. This is said to be very accessible and makes changing cut-off length a very simple operation. Accuracy of cut is $\pm \frac{1}{32}$in.

The machine has been tested exhaustively in Dixon's own factory. It has been specially designed for cutting plastics, but it will also handle a wide range of other materials from paper to bookcloths.

A machine is permanently installed in the company's showroom at Works Road, Letchworth, Herts., and Dixon is giving demonstrations to any interested people in the plastics industry.

Dixon, which employs 130 people at Letchworth, also makes hydraulic moulding presses, loading tables, slug cutters, spreading and other machinery.



The new 419 model complements Dixon's 537 slitting machine. It will take rolls up to 25in. wide and 12in. diameter

The New President of the PI

SIR Laurence Merriam, chairman of British Xylonite, has now been elected President of the Plastics Institute for the session 1961-62.

Sir Laurence was educated at St. Paul's School and University College, Oxford; he was commissioned in the Rifle Brigade and Tank Corps and was awarded the MC during the 1914-18 war.

He joined the British Xylonite Co. in 1919 and became the first managing director of BX Plastics in 1939.

After spending the period 1940-45 with the Ministry of Supply and acting as Special Examiner of Controls for the Board of Trade from 1948-50, he was knighted in 1949. He has been chairman of British Xylonite since 1959.

Vice-presidents of the Institute for 1961-62 are: P. C. Chaumeton, Sir John Dean, P. A. Delafield, G. Dring, S. Ellice-Clark, G. W. Hodds, J. Lesser, W. F. Mitchell, A. E. Skan, Sir Miles Thomas, W. C. Waghorn and G. J. Wevell.

New ordinary members of Council for 1961-62 are: F. P. Hiron, M. Jones, M. Kaufman, and A. A. Tomkins.

Shell Introduces Oil-Extended Isoprene Into UK

SHELL Chemical Company Ltd. announced this week that it has introduced into the UK an oil-extended version of its Cariflex isoprene rubber.

This product, known as Cariflex I-500, is a high molecular weight *cis* 1:4 polyisoprene extended with 25phr of a non-staining naphthenic oil.

It will be supplied in 65lb. bales at 23.5d. a lb. ex store or 23.75d. a lb. delivered.

The straight Cariflex isoprene rubber already on the UK market priced at 26.5d. a lb. ex store or 26.75d. a lb. delivered, will now be known as Cariflex I-300 to distinguish it from the oil-extended type.

●Some characteristics of oil-extended isoprene are discussed in the article on 'Compounding and Processing of Isoprene Rubber', on page 318.

Telephone Cables Move

Associated Electrical Industries Ltd. and Enfield Cables Ltd. have now transferred all their business in polythene insulated telephone cables, and in co-axial and other high grade cables for telecommunications to Telephone Cables Ltd., Chequers Lane, Dagenham, Essex.

Telephone Cables Ltd., formed in January this year, and jointly owned by AEI and Enfield Cables, is now handling all home and export business in this field for both companies.

Telephone Cables Ltd. is said to have at Dagenham the most modern telephone cable production unit in the UK. It is the largest supplier of telephone cables to the British Post Office, for whom it also carries out extensive trunk cable installations.

New Polymerization Catalyst

Novadel Ltd., St. Ann's Crescent, Wandsworth, S.W.18, has recently announced that small-scale production of di-isopropyl peroxy dicarbonate has been started. This product, sold under the trade name Perkadox IPP, is recommended for the polymerization of vinyl monomers, allyl and acrylic esters, olefines and polyesters.

AKU President Dies

Prof. Pieter W. Kamphuisen, president of the Board of Algemene Kunstzijde Unie NV (AKU), died in Arnhem Hospital this week. He was 64.

No Dominance in Rubber

AMERICAN ECONOMIST ON NR AND SYNTHETIC COMPETITION

AN American economist, T. R. McHale, says that under present cost, economic and technological conditions, it is unlikely that either natural or synthetic rubber will gain dominance over the other. But it is also unlikely, he adds, that the world's natural rubber industry will remain unscathed by the emergency of a new era of competition and its future is probably less promising than at any time in its history.

Writing in the latest issue of the *Malayan Economic Review*, Mr McHale says significant differences in the average cost structures of the two products are immediately apparent. Natural rubber production involves heavy labour input per unit of output against low labour input per unit of synthetic output. There is almost no natural rubber counterpart to the raw material cost of synthetic rubber but there are relatively heavy administration costs for the production of natural which synthetic rubber production lacks.

Indivisible Costs

He says the production of natural rubber can be organized in many different ways and cost efficiency maintained over a wide range of product sizes. But synthetic output involves highly indivisible costs in the form of capital equipment and cost efficiency in production depends on relatively large production unit sizes and high utilization of available capacity.

Mr McHale says that the competitive positions of natural and synthetic rubbers will depend, in the long term, to a large extent on key cost factors peculiar to each product rather than common to both.

Sun Cooks Breakfast

A SOLAR cooker containing reinforced plastics and worked by the sun's energy was shown in Rome on Monday (August 21) at the United Nations Conference on New Sources of Energy.

Called the Umbroiler, it consists of a concave reflector that opens and closes exactly like an umbrella. The inner surface is made of a thin reinforced plastics skin backed with aluminium. Made by the Umbroiler Co. of Denver, Colorado, the reflector is focused at the sun and a quart of water can be boiled in 20 minutes. Egg and bacon can be dished up in 10 minutes.

Other solar cookers, of similar design, are also on show. One has a polystyrene body and the reflector is made of polyester film backed with metal.

Delegates are attending the conference from more than 70 countries. They will talk about 200 papers and discuss the harnessing of energy from winds and hot springs, as well as from the sun.

Kon-Tiki Type Test for Polyether Foam

An 18ft. 6in. sloop with a crew of three is setting out from Bristol today (August 26) to sail round the world. The sloop — *Spartan Spirit* — is the smallest boat ever to attempt a world cruise.

Dunlopillo have provided mattresses for the two bunks, and the crew will report on these on their return. The mattresses are made from two different densities of polyether foam, produced by the company at Hirwaun, and the rigours of the trip — estimated to take two years — will provide a stringent test of their performance.

The sloop will be sailing in an easterly direction as close to the equator as possible. Prevailing winds and ocean currents are generally in opposition to such a passage, and are anticipated during at least two-thirds of the 30,000 mile voyage.

UK Agents for Polyflo

Croxton and Garry Ltd., 27 St. James Road, Kingston-on-Thames, has been appointed sole agents in the UK for distribution of Polyflo.

This is an additive for polythene and polypropylene manufactured by Moore and Munger Inc., 33 Rector Street, New York 6. It is claimed that the use of the material enables production rates to be increased by 50% and that it can be incorporated in polymers by dry mixing.

Building Operations at Baglan Bay

BRITISH Hydrocarbon Chemicals Ltd., acting through the engineering division of the Distillers Co. Ltd., has placed with the Turriff Construction Corporation Ltd. a contract for the construction of various buildings for its projected petrochemical complex at Baglan Bay, Swansea.

The contract provides for the erection of a building block, workshops, canteen, administration and works offices, chemical stores, fire station and other buildings.

Value of the contract is estimated at £480,000 and work is to begin on September 1 1961.

DCL Engineering Division was responsible for the design of the buildings, in collaboration with their consultant architect, M. Pattrick.

The Baglan Bay £10m. complex will follow roughly the same pattern of operation as Grangemouth. One plant will make the ethylene dichloride intermediate for the manufacture of vinyl chloride monomer.

Butadiene will be extracted and refined for sale for the manufacture of synthetic rubber and other copolymers.

It is planned to bring the plant into operation in the last quarter of 1962.

World's Record on Avon Tyres

A new world's motor-cycle record for the one kilometre standing start, 1,000cc class, category A, was set up at Thurley Airfield, Bedfordshire, on Sunday (August 20) by George Brown on a 998cc Vincent Special.

This was fitted with an Avon 18in. Slick rear tyre made specially for the record attempt with a 'super-cling' tread compound. The front tyre was a normal Avon racing front tyre.

He covered the distance in 20.573 sec. at 108.74mph beating the previous record of 106.77mph set up by Alfredo Milani on a Gilera.

MoH Order for Hairlok

A £20,000 order for 3,000 mattresses has been given to the Hairlok Co., of Bedford, by the Ministry of Health.

The mattresses, which will contain the company's Texfoam latex foam, will be supplied over a year's period to various hospitals in the UK.

PVC on TV

Iridon Ltd. has produced a special grade of pvc for ceiling panels. This can be vacuum formed, and panels made from it were used recently to build interior sets for a television production.

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Compounding and Processing of Isoprene Rubber

DIFFERENCES FROM NR AS IMPORTANT AS SIMILARITIES

By P. G. CROFT-WHITE, MA, BSc (Oxon),
Shell Chemical Co. Ltd.

WHEN synthetic *cis*-polyisoprene first came on to the scene a few years ago it was hailed as 'synthetic natural rubber'. In fact, the characteristics of the synthetic and natural polyisoprenes are very similar and there is an understandable temptation to treat them as identical. However, this should be resisted, for the greater the similarities the more important become the differences and these differences must be appreciated if the true merits of the synthetic *cis*-polyisoprene are to be realized.

As soon as the work of Ziegler and Natta and many others had opened up the way to exert control over the stereo-regularity of polymerization, it was natural that attempts should be directed towards the copying of Hevea rubber. The closeness of the approach by the synthetic route may be judged by comparing the infra-red spectra of both products (Fig. 1). At the moment, however, it cannot be claimed that an exact match has been achieved. This is hardly surprising when considering the large number of criteria which must be applied; the most important of these are: (i) The structural purity (% *cis*-content); (ii) The distribution of non-*cis* material (the sequence length of *cis*-elements); (iii) The average molecular weight; (iv) The molecular distribution; (v) The gel content; (vi) The presence and type of non-rubber constituents.

Many Types Possible

These features are directly determined by the type of catalyst used and the method of working up the product. In fact, it should be possible to produce at least as many types of synthetic isoprene rubber of high purity as there are grades of natural rubber of varying purity. The purpose of this paper is not to review all these various types but to deal specifically with one particular type and its close modifications which is now commercially available and known as Cariflex Isoprene Rubber. The description of the rubber may include a number, *e.g.* Cariflex I-300, which is a straight rubber, and Cariflex I-500 which is an oil-extended rubber containing 25phr of a light-coloured naphthenic oil.

Cariflex IR is a virtually colourless product. It has a high *cis* content (ca 92%), a high molecular weight and freedom from gel. It is a rubber which is easily processable on existing equipment to give technologically satisfactory and commercially acceptable vulcanizates. Some characteristics of Cariflex I-300 are listed in Table 1 (Page 321).

It will be noted that the viscosity molecular weight is over 2m. As a result of this it has been found that Cariflex IR shows anomalous behaviour when Mooney viscosity measurements are made. When the molecular weight exceeds about 600,000 the linear relationship with viscosity ceases to hold and indefinite and irreproducible results may be obtained. In fact, in these circumstances it is not true viscous flow which is being measured, but rather the friction between cleavage planes within the sample.

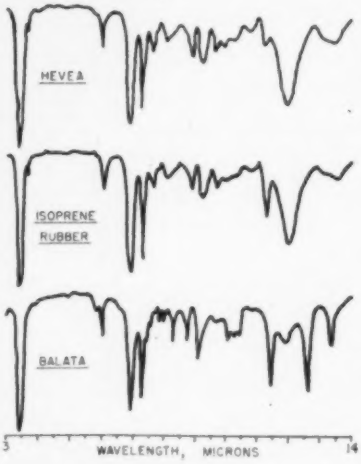

Fig. 1
Infrared spectra of polyisoprenes

It is, of course, necessary to be aware of this phenomenon when Mooney viscosity is used for factory control. Thus, it is observed, when Cariflex IR is masticated on a mill or in an internal mixer, that the apparent Mooney value will initially increase and then decrease when the rheological conditions more normal to the test are established.

Cariflex IR types contain some non-staining antioxidant. This is added to protect the rubber during manufacture and subsequent storage. It is recommended that further antioxidant be added during compounding.

Compounding of Cariflex IR

In general the principles of compounding Cariflex IR are similar to those applicable to natural rubber. However, the temptation merely to replace natural rubber by the IR in a compound should be avoided since the difference between the two rubbers may be enough to give discouraging results.

As far as pure gum compounds are concerned it is important to take account of: (i) The tendency of IR to reversion when over-cured; (ii) the rather lower modulus shown by IR compounds when compared with similar NR compounds.

The reversion is due to the absence in IR of the natural bases and proteinaceous materials found in NR and indeed it is a phenomenon also shown by deproteinized natural rubber. In practice it may be corrected by the addition of a mixture of soya-lecithin and triethanolamine (TEA), but in view of the variability and relatively high cost of lecithin the use of triethanolamine alone or the incorporation of a secondary basic accelerator such as diphenyl guanidine or hexamethylene tetramine may be preferred. This will also have the effect of raising the modulus. It should be noted that reversion is not apparent in black-loaded Cariflex IR compounds and the addition of basic ingredients is not then necessary. In Table 2 the effect of the addition of lecithin/triethanolamine and DPG is shown.

The curative systems employed in natural rubber compounds are normally fully satisfactory in IR although slightly higher levels are required. The dispersion of accelerators is facilitated by the choice of those having relatively low melting points, *e.g.* substituted thiazoles. Some properties of tread compounds containing Cariflex IR and a number of

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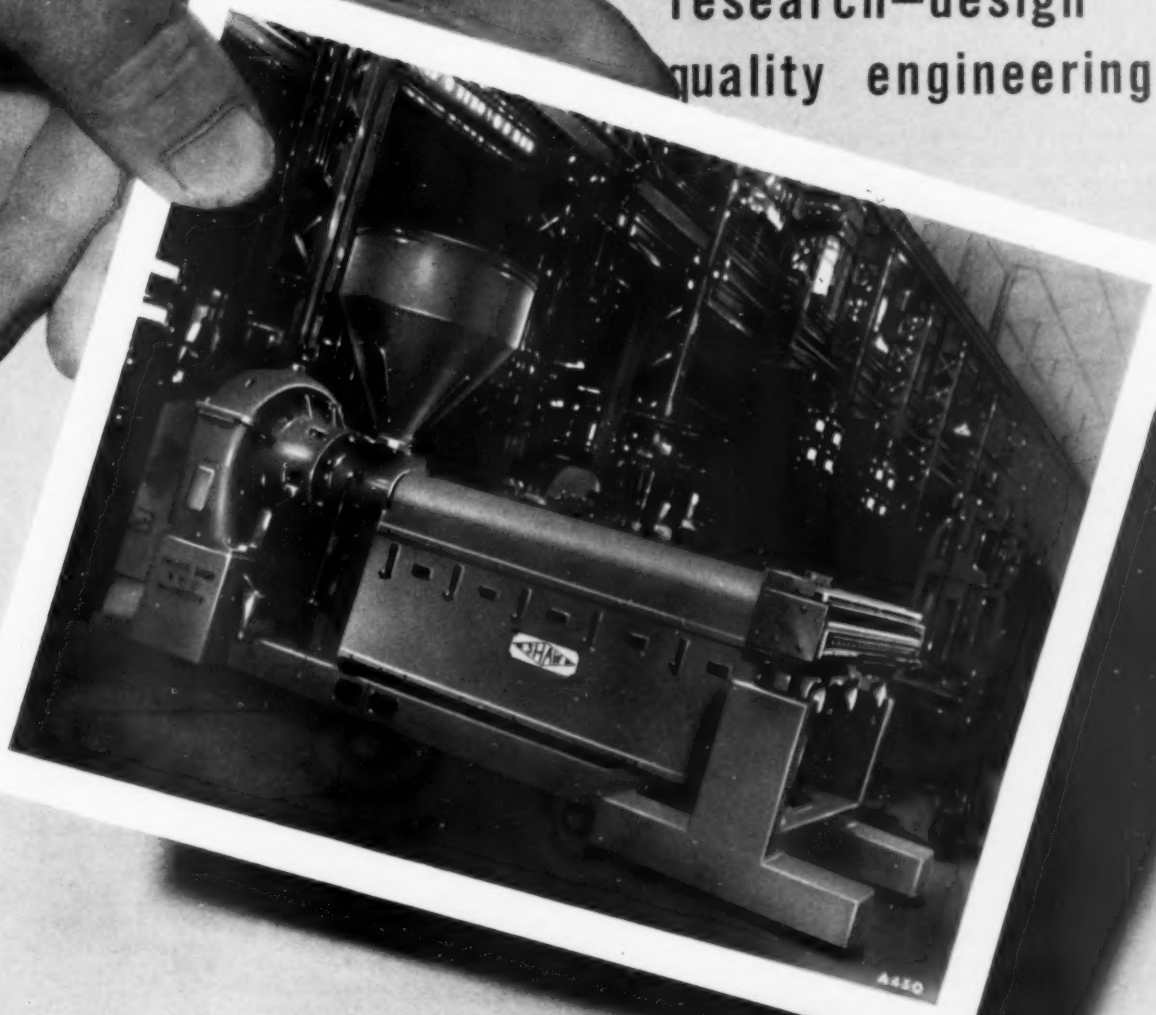

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OVERSEAS AGENTS THROUGHOUT THE WORLD

P4397

curative systems are shown in Table 3; as a result of recent improvements in polymer quality it may be possible to reduce accelerators below the levels quoted herein.

As stated above, antioxidants should be incorporated when compounding Cariflex IR. Hindered phenols may be recommended for non-staining compounds; amine or ketone/amine condensation products where staining is not a disadvantage.

In certain circumstances — mentioned below — it may be desirable to use blends of Cariflex IR with natural rubber and in this connexion attention is drawn to the good physical properties which can be achieved with such blends, as shown in Table 4.

In filled Cariflex IR compounds the normal fillers will exhibit much the same effect as they do in natural rubber. In black loaded compounds accelerator levels of 0.5–1.0phr with sulphur at 1.75–2.75phr would be normal.

Although addition of triethanolamine with or without lecithin or a secondary accelerator is not necessary in black compounds, one or other should be incorporated into compounds based on Cariflex I-300 and containing reinforcing or non-reinforcing white fillers. With hydrated silica and silicates it is desirable to add an activator of the diethylene or polyethylene glycol type.

Processing

Although Cariflex IR can be processed in much the same way as natural rubber and on conventional rubber equipment it is important to recognize the difference in detail that exists.

When compounding IR in an internal mixer it is essential that a short breakdown cycle is used, for otherwise the compounded rubber will be discharged in a crumbly state and will give difficulties during subsequent processing, *e.g.* extrusion.

The breakdown is necessary because of the very high molecular weight of Cariflex IR, and it is conveniently achieved by the addition of 0.25phr of Pepton 65 (American Cyanamid Co.). Mixing of the peptizer is continued either until the temperature reaches about 100°C. or for a maximum of two minutes normally. Greater breakdown than this may give rise to poor vulcanizate properties and consequently it is recommended practice to add pigments, etc., as soon as this temperature has been reached.

During Banbury mixing it is found advantageous to have the ram riding well on the compound and it should be noted that the loading of a Banbury may be 3-4% higher with Cariflex IR than with natural rubber. Full cooling should normally be applied throughout the mixing cycle.

When mill mixing is used, no particular difficulty is likely to be experienced, though the band may be found to be dry and lacey initially. In such a case the addition of compounding ingredients may be found to be more effective than further mastication in obtaining a coherent band. The use of a peptizer will not normally be necessary when compounding on a mill, but if it should be considered desirable, such as where the stock is to be further processed by extrusion or calendering, 0.25phr Pepton 65 could be added, keeping the mill temperature at 80–90°C. and mixing for 3-5 minutes. Once the band is formed, compounding follows normal procedures for natural rubber, though it may be found that too rapid addition of fillers causes bagging and crumbling. For general mixing, a cool mill should be used, *e.g.* 60–70°. If the temperature cannot be held as low as this a tight nip is recommended.

When incorporating accelerators it should be remembered that the IR compound may be rather soft on the mill and the stock temperature may be lower than expected. Thus it is desirable for this purpose to use relatively hot mills or, better, accelerators with relatively low melting points, *e.g.*, the TMTM or CBS types. If it is required to use MBT or MBTS, incorporation as a masterbatch in natural rubber will generally be found effective.

The further processing of IR compounds — *e.g.* by extrusion or calendering — is similar to that of natural rubber, though in general lower temperatures (e.g. below 80° on calenders) should be used. It will be observed that uncured IR compounds are comparatively soft and the rather low green strength may in some cases cause difficulties in take-off from a calendar or in the collapse of extruded tubes, etc.

In these cases the use of blends of natural rubber with the isoprene rubber may be recommended. In fact, when processing difficulties of this type might be expected it is recommended that blends be evaluated initially in which the IR content is increased to the optimum.

Vulcanizate Properties

Pure Gum Compounds

The results quoted in Tables 2 and 3 make it clear that IR has the same self-reinforcing characteristics as natural rubber. Tensiles very close to those of natural rubber compounds can be achieved with both IR alone and with NR blends. The elongation at break is higher with IR than NR and the 300% modulus is lower; the resilience is marginally higher.

In the case of tear strength the method of test becomes important. When tear initiation is measured (ASTM angle test) IR compounds give similar results to NR compounds but tear propagation (BS and Delft tests) is rather easier in IR. It is found, however, that the tear strength of IR decreases less than that of natural rubber compounds on ageing.

Black-filled Compounds

In Table 5 tyre tread compounds based on Cariflex IR and natural rubber are compared. When identical formulations are used the synthetic product imparts rather lower tensile strength and tear properties but shows up markedly better with respect to flex life and cut growth. Tables 6 and 7 give results for a carcass stock and for compounds containing SRF and MT blacks.

Non-black Compounds

The properties of typical white compounds — one with hydrated silica, the other with whiting — are given in Table 8.

Application of Isoprene Rubber

Tyre Applications

The largest single use of natural rubber is in commercial vehicle treads and a number of road tests have been carried out using 50/50 blends of isoprene rubber and natural rubber. These blends have been found to give compounds which can be processed without difficulty in the factory and to give products with wear properties similar to those of an all-natural rubber tread. This work is now being extended to study the behaviour of 75/25 Cariflex IR/natural rubber and 100% Cariflex IR based treads.

Tests on carcass compounds based on 50/50 blends of IR and natural rubber have been fully satisfactory on a factory scale though attempts to use blends richer in IR have not yet been successful since separation from the bead occurs on standing, due to the plastic flow of the uncured compound. Typical carcass compounds are shown in Table 6. Cariflex IR has given very satisfactory performance in sidewalls. Its main advantage is its particularly good mould flow which reduces the number of mould defects. Its good colour is also an advantage for the manufacture of white sidewalls. (Table 9). In this connexion it may be noted that it

may be satisfactorily blended with neoprene.

Non-tyre Applications

The main characteristics of Cariflex Isoprene Rubber which will ensure its utilization in these applications are: (i) Very good initial colour and colour stability on exposure to UV; (ii) a higher degree of chemical purity; (iii) good mould flow properties giving sharper mouldings with fewer rejects.

In view of these it will be clear that IR can be effectively employed in the place of high grade pale crepes *e.g.*, in surgical and clinical mouldings. It may also be used in products such as swim fins (Table 10), bathing caps (Table 11), hot-water bottles, washing machine gaskets, intricate electrical mouldings, etc., where all the above characteristics may be important. The prospects of utilization of IR in electrical mouldings are enhanced by its inherently good electrical properties. Thus its dielectric strength, volume resistivity and dielectric constant are at least similar to natural rubber but it has the advantage of lower water absorption.

It has been mentioned above that Cariflex IR pure gum or lightly-filled compounds have lower moduli than equivalent compounds based on Hevea. This may be put to good effect in applications such as elastic bands and threads. Properties of rubber band compounds based on NR and IR are shown in Table 12.

The possibility of using Cariflex IR in sponge compounds is suggested by the fact that the rubber is readily broken down by peptization to low viscosities and the resultant blown products will show a greater resilience than those based on SBR.

Some general formulations for Cariflex IR are given in Tables 13-16 which will further indicate how this rubber may be used.

Oil-Extended Isoprene Rubber

Cariflex I-500 is a high viscosity polymer extended with 25phr of a light-coloured naphthenic oil. In general the processing of this type is similar to that described for the non-oil-extended product. In spite of the fact that it contains oil it will still be found necessary to peptize the polymer because of the higher molecular weight. Failure to do this may result in poor behaviour in mixers and inadequate dispersion of ingredients, giving rough extrusions, etc.

It is normal in compounding to consider 1-500 as 100% rubber hydrocarbon. However, the sulphur and accelerator levels required are lower than those recommended for Cariflex I-300. The oil-extended rubber is sensitive to excess curatives.

Some details relating to pure gum stock and black compounds with HAF and FEF are given in Table 17. It will be noted from this that lecithin/TEA is not required in gum compounds based on the oil-extended IR.

Isoprene Rubber Latex

Isoprene Rubber Latex has not so far been available in sufficient quantities for full evaluations to have been made in all end uses, but the work carried out to date indicates that it will find many uses in such applications as dipped goods, carpet backing, reconstituted leather, etc.

Typical properties on Cariflex IR latex are given in Table 18. Work on the use of IR latex in foamed products is in hand and the initial results have been encouraging.

Conclusions

The Cariflex Isoprene Rubbers are a new range of polymers closely resembling natural rubber. The similarities, however, should not be allowed to mask the differences. Furthermore, it must not be thought that all stereoregular *cis*-polyisoprenes are identical. They are all new and all have their own characteristics; unless these are fully appreciated they will not be used to their best advantage. In view of this it is recommended that the synthetic products, such as the Cariflex IR range, be evaluated according to the manufacturers' recommendations, rather than attempting to apply, as such, techniques and formulation established for Hevea. The comments and suggestions above will help to ensure satisfactory results.

TABLE 1

Characteristics of Cariflex Isoprene Rubber I-300

Colour	White
Antioxidant	Non-staining, non-discolouring
Structural purity	92% *cis*-polyisoprene
Organic acid, % w.	1.35
Ash content, % w.	0.40
Intrinsic viscosity	8.0dl/g.
Mooney viscosity (ML-4 at 212°F)	55
Weight average molecular weight	2,500,000
Specific gravity	0.92

TABLE 2

Effect of Lecithin/Triethanolamine and Secondary Accelerator on Cariflex IR Pure Gum Vulcanizate Properties

Cariflex I-300	100	—	100
RSS 3	—	100	—
Stearic acid	3	3	3
Zinc oxide	5	5	5
PBNA	1	1	1
MBTS	1	1	1
Lecithin/TEA	1.5	—	—
DPG	—	—	0.5
Sulphur	2	2	2
Modulus at 500%, psi.	425	510	510
Tensile strength, psi.	3,350	3,400	3,945
Elongation at break, %	960	820	870
Yerzley resilience, %	93	90	96
Tear strength (ASTM angle), psi.	400	315	385

TABLE 3

Accelerator Variations (phr) in Standard Tread Compound based on Cariflex I-300

	Opt. cure min.	Tensile strength psi	300% modulus psi	Elongation %
MBT (.4), TMTD (.16)	20	3,550	1,590	570
Santocure (1.25)	20	3,675	1,560	580
NOBS No. 1 (1.50)	20	3,625	1,560	590
NOBS No. 1 (.8), DPG (.32)	30	3,600	1,520	580
MBT (.3), M. Zimate (.18)	20	3,500	1,520	560
NOBS No. 1 (.7), DPG (.28)	30	3,675	1,420	570
MBT (.3), TMTD (.12)	20	3,525	1,400	610
NOBS No. 1 (1.0)	20	3,675	1,300	640
Santocure (1.0)	20	3,500	1,300	650
MBT (1.75)	30	3,550	1,230	610
MBT (1.25)	30	3,475	1,130	630

TABLE 4

Properties of Pure Gum Vulcanizates based on Cariflex IR/Natural Rubber Blends

Cariflex I-300	100	75	50	—
RSS 3	—	25	50	100
Zinc oxide	5	5	5	5
Stearic acid	3	3	3	3
PBNA	1	1	1	1
Lecithin/TEA	1.5	1.1	.75	—
MBTS	1	1	1	1
Sulphur	2	2	2	2

Property	Cure time				
300% modulus, psi	30	115	120	—	—
	40	155	185	185	115
	55	215	215	215	185
	75	215	230	245	245
500% modulus, psi	30	200	245	—	—
	40	325	330	325	245
	55	425	445	450	510
	75	450	480	580	645
Tensile strength, psi	opt.	3,350	3,720	3,825	3,400
Elongation at break, %	opt.	960	860	830	820
Yerzley resilience, %	opt. + 5	93.1	94.8	94.6	89.6

TABLE 5

Tyre Tread Compounds based on Cariflex IR and Natural Rubber

I-300 or NR	.. .. ..	100
Zinc oxide	.. .. ..	5
Stearic acid	.. .. ..	3
BLE — 25	.. .. ..	1
Agerite — HP	.. .. ..	0.2
HAF Black	.. .. ..	50
Dutrex R	.. .. ..	3
Santocure	.. .. ..	1
Sulphur	.. .. ..	2

	I-300	NR
300% modulus, psi ..	1,975	2,330
Tensile strength, psi ..	3,580	4,045
Elongation at break, % ..	520	480
Yerzley resilience, % ..	70	78
Heat build-up (above 37.8° C.), °C.	27	24
Shore hardness	65	65
De Mattia flex:		
(*a*) Crack initiation, kc.	90	33
(*b*) Growth 2-15mm., kc.	430	280
Abrasion index, Akron-Croydon (15° angle) ..	85	87

TABLE 6

Cariflex IR in Tyre Carcass Stocks

Cariflex I-300 ..	100	100
Zinc oxide	5	5
Stearic acid ..	3	3
Agerite HP	1	1
FEF Black	30	14
Softener	5	5
Santocure	0.6	0.6
Sulphur	2.75	2.75
Cure at 292° F., min.	30	30
Tensile strength, psi	3,400	3,400
300% modulus, psi	900	400
Elongation at break, %	600	800
Angle tear, psi ..	230	160
Yerzley resilience, %	76	87
Specific gravity ..	1.07	1.025

TABLE 7

Cariflex IR Compounds with SRF and MT Blacks

Cariflex I-300				100
Stearic acid				3
Zinc oxide				3
'Octamine'				1
Light process oil				10
Sulphur				2.75
SRF black	25	50	100	150
Santocure	0.65	0.70	0.80	1.10
Shore hardness	33	47	67	82
300% modulus, psi	255	625	1,700	—
Tensile strength, psi	2,975	2,550	1,975	1,805
Elongation at break, %	860	690	400	170
Yerzley resilience, %	85	82	74	—
MT Black	25	50	100	150
Santocure	0.65	0.70	0.80	1.10
Shore hardness	34	40	53	65
300% modulus, psi	155	325	745	1,225
Tensile strength, psi	2,630	2,625	1,950	1,445
Elongation at break, %	880	780	610	450
Yerzley resilience, %	88	85	82	74

TABLE 8

Cariflex IR Compounds with White Fillers

Cariflex I-300	100	100
Zinc oxide	5	5
Stearic acid	3	3
Antioxidant 2246	1	1
MBTS	1	1
DPG	0.5	0.5
Sulphur	2	2
Diethylene glycol ..	2.5	—
Ultrasil VN 3	40	—
Ground whiting	—	75
300% modulus, psi ..	285	200
500% modulus, psi ..	675	395
Tensile strength, psi ..	3,575	2,300
Elongation at break, % ..	900	820

TABLE 9

Cariflex IR in a White Sidewall Compound

Cariflex I-300	100
Wingstay S	1
Zinc oxide	15
Stearic acid	3
Ultramarine Blue	0.2
Hard clay	25
Titanium dioxide	20
Sunproof Improved	3.5
Microcrystalline wax	1.5
TMTM	0.75
Sulphur	2.5
Cure at 292° F. (min.)	20
Tensile strength, psi	1,800
Elongation at break, %	900
Specific gravity	1.25

TABLE 10

Cariflex IR in Swim Fin Compounds

	Blade	Heel
Cariflex I-300 ..	20	50
Cariflex S-1707 ..	45	—
Cariflex SP-103 ..	70	—
Smoked sheet ..	—	50
Zinc oxide	2	2
Stearic acid	3	2
Anti-sunchecking wax	1	—
Non-discolouring antioxidant ..	1	1
Hydrated silica ..	—	7
MBTS	.75	0.5
TMTM	.75	0.4
Sulphur	2.75	2.5
Titanium dioxide ..	—	0.5
Colour	as required	
Cure, min. at 310° F.	15	15
Tensile strength, psi	1,200	2,800
Elongation at break, %	400	750
Hardness, Shore A ..	73	35
Specific gravity ..	1.00	1.00

TABLE 11

Cariflex IR in Bathing Cap Compound

Cariflex I-300	100
Zinc oxide	10
Titanium dioxide	10
Stearic acid	3
Ancap	0.5
TMTM	0.2
Anti-sunchecking wax	3.0
Fine precipitated calcium carbonate	25.0
Sulphur	2.0
Specific gravity	1.17

TABLE 13

A Light-coloured Transparent Gum Stock

Cariflex I-300	100
Zinc stearate	2
Zn MBT	0.5
Sulphur	2
Stearic acid	3
TMTM	0.3
Non-staining antioxidant ..	1.0
Anti-sunchecking wax	2.0
Cure at 310° F., min.	10
Tensile strength, psi	3,600
Elongation at break, % ..	900
300% modulus, psi	130
500% modulus, psi	280
800% modulus, psi	1,720
Specific gravity	0.93

TABLE 14

High-quality Non-Black Compound for Moulded Goods based on IR and SBR

Cariflex S-1502	50
Cariflex I-300	50
Zinc oxide	3
Stearic acid	3
Light process oil	5
Anti-sunchecking wax	2
Hard clay	70
Non-discolouring antioxidant ..	1
Santocure	1
Sulphur	3
Polyethylene glycol	1
Cure at 335° F., min.	5
Tensile strength, psi	2,600
300% modulus, psi	600
Elongation at break, % ..	730
Hardness, Shore A	55
Specific gravity	1.26

TABLE 15

High-hardness Non-Black Compound

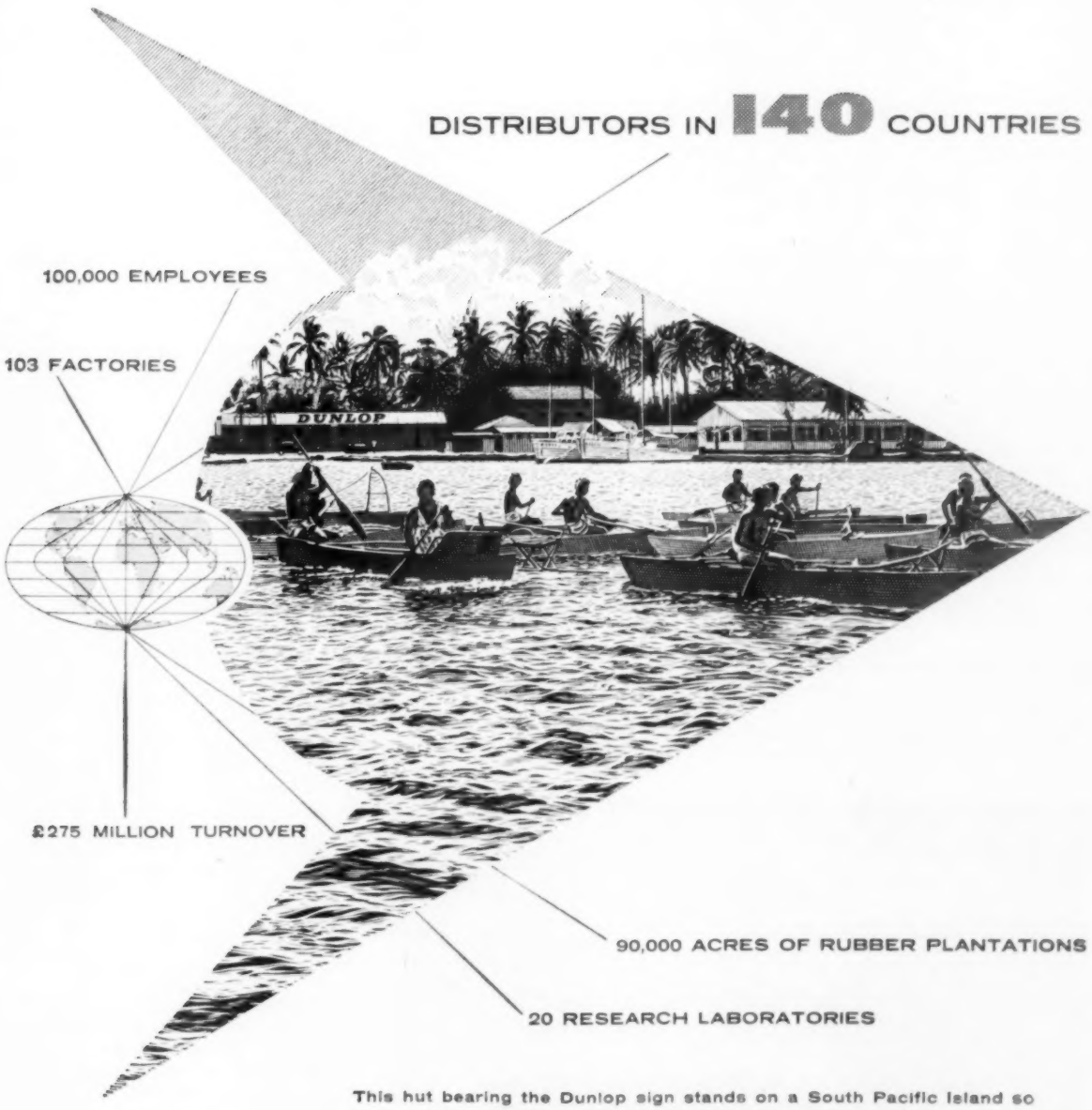
Cariflex I-300	85
Cariflex SP 103	30
Non-staining antioxidant ..	1
Zinc oxide	3
Stearic acid	3
Hard clay	125
Santocure	2
Sulphur	3
Cure at 292° F., min.	20
Tensile strength, psi	1,950
300% modulus, psi	740
Hardness, Shore A	74
Specific gravity	1.40

TABLE 12

Cariflex IR in Rubber Band Compounds

Cariflex I-300	—		75		100	
RSS No. 1	100		25		—	
Zinc oxide	4		4		4	
Stearic acid	4		4		4	
Antioxidant	1		1		1	
Vulcafor HBS	0.7		0.7		0.7	
Sulphur	2.0		2.0		2.0	
Cure time:	M300%	TS	M300%	TS	M300%	TS
20 min.	170	3,200	100	3,680	100	3,690
30 „	240	3,780	180	3,740	170	3,680
45 „	240	3,650	170	3,840	170	3,440
60 „	210	3,100	190	2,990	180	2,870

BEHIND THE DUNLOP SYMBOL



This hut bearing the Dunlop sign stands on a South Pacific Island so isolated that a boat calls only once every three months. But communities everywhere demand Dunlop products and so even in this remote place there is a Dunlop distributor. This depot is one of many hundreds, small and large, covering the world. Recent years have seen such an expansion of Dunlop operations that today there are distributors in 140 countries, providing an increasing range of products and services. Wherever men build, mine, farm and travel, a Dunlop distributor is near at hand to supply their essential needs.

CTH/PRS/56

DUNLOP SYMBOL OF PROGRESS

TABLE 16
Cariflex IR in a Low-cost White Compound

Cariflex 1-300	100	Sulphur	4.0
Titanium dioxide	15	Antioxidant	1.0
Soft clay	120		
Hard clay	50	Cure at 300°F., min.	12
Zinc oxide	5	Tensile strength, psi	1,500
Stearic acid	5	Elongation at break, %	550
TMTD	0.5	300% modulus, psi	800
Bismate	0.1	Hardness, Shore A	65
MBTS	1.5	Specific gravity	1.63

TABLE 17
Some Properties of Compounds based on Oil-extended Cariflex I-500

	Gum	Carcass	Tread
Cariflex I-500	100	100	100
Pepton 65	0.1	0.1	0.1
Zinc oxide	3	3	3
Stearic acid	3	3	3
HAF black	—	—	50
FEF black	—	30	—
Antioxidant	1	1	1
Santocure	0.5	0.6	0.6
Sulphur	1.75	2.0	2.0
Cure at 144.5°C., min.	30	22	22
Tensile strength, psi	2,350	3,050	3,300
300% modulus, psi	150	800	1,600
Elongation at break, %	680	700	550
Yerzley resilience, %	96	89	70
Heat build-up (Goodrich) cover 70°C., °C.	—	5½	18
Mooney ML-4, 212°F.	25	43	56
Suggested alternate acceleration:			
MBTS/TMTD	—	0.5/0.05	0.5/0.05
NOBS No. 1	—	0.6	0.6
TMTM	0.3	—	—
ZMBT/TMTM	0.4/0.2	—	—

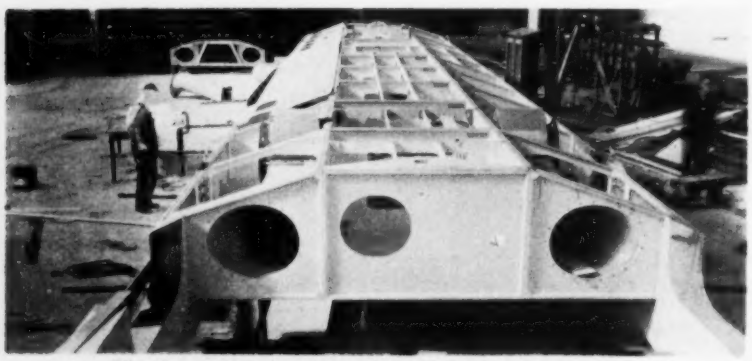
TABLE 18
Typical Properties of Cariflex IR Latex

Total solids, % w.	62
pH	10
Surface tension, dynes	40
Brookfield viscosity, cps (No. 2 spindle, 30rpm.)	110
Antioxidant (phr)	2
Film properties*	
Tensile strength, psi	4,900
300% modulus, psi	500
Elongation at break, %	1,000
*Cured at 100°C. in hot air using following formula:	
Rubber hydrocarbon (dry weight)	100
ZDC	1
ZMBT	0.75
Zinc oxide	5
Antioxidant	1
Sulphur	2.5
5% methyl cellulose (50 cps)	1

Half and Half Hovercraft

A RESEARCH marine hovercraft, forerunner of a commercial passenger-carrying vehicle, was demonstrated recently by William Denny and Bros. Ltd. of Dumbarton.

Plywood is used in the construction of the main framework. The plywood sections are glued together with Aerodux resorcinol resin made by Ciba (ARL) Ltd. This provides a glued construction has been used, based on resorcinol resin.



The framework is glued with Ciba's resorcinol resin

The hovercraft, which weighs about 4½ tons, is rectangular in shape and is about 60ft. long. It differs from other experimental hovercraft types in that its side-walls remain continuously in the water and the machine never becomes fully airborne, although its weight is supported by an air cushion.

a water- and weather-proof hull of great strength.

Denny says that it hopes to have a passenger-carrying 'Hovership' in operation by next spring.

5.20-10 Michelin SDS

Michelin is now producing a 5.20-10 tubeless tyre in the SDS range. The retail price is £5 9s. 6d.

Weather Stripping

Weather stripping is now the biggest US market for self-adhesive urethane foam, according to a report from Allied Chemical International. Other fast-growing applications are said to be gasketing, case liners, display items, teaching and lecture aids, dust seals in television sets, sound deadeners under car hoods, and insulation in gas detection equipment.

One US company, Air-O-Plastick Corp., is offering flexible urethane foam with self-adhesive backing for a wide variety of cushioning, insulating and sealing applications.

Pigmented Chips

Dispersions Ltd. has constructed a new factory at Merton, London, S.W.19, for the manufacture of pigmented chips and dispersions in a wide range of materials, including nitrocellulose, cellulose acetate, ethyl cellulose, pvc and vinyl resins.

Technical advantages claimed for formulators include higher gloss, superior durability, uniformity from batch to batch, improved adhesion and higher ratio of pigment to binder.

Marley Plaza

A new addition to the Marley De Luxe floor tile range is the Plaza tile.

Of high vinyl content, the size is 12in. x 12in. 80/100in. thick, flexible and resistant to grease and acids, they may be laid over wood or concrete.

PLASTICS MACHINERY DEVELOPMENTS

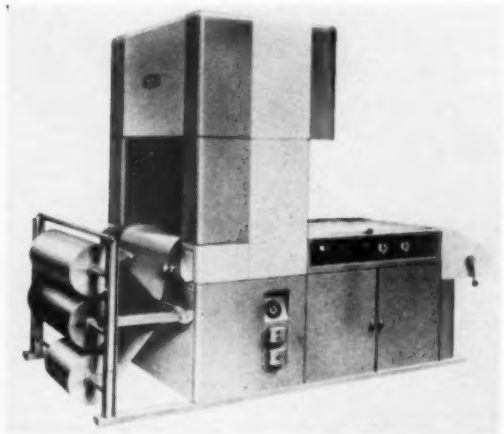
Fully Automatic HF Welding Machine

16 CYCLES A MINUTE OBTAINED

By JOHN SHEARING

CONSIDERABLE advances have been made in recent years in high frequency welding techniques. Many refinements have been introduced and, like all other processes, methods have been moving in the direction of automatic operation.

The range of Acme high frequency welders by HF Industrial Services Ltd., has played a prominent part in these developments and many excellent machines have been produced. The company has now taken the development a stage further by the introduction of a fully-automatic model. This has many attractive features and is likely to be a very valuable addition to the range, the claim being made that this is the first machine in the world to overcome all the problems accompanying fully automatic presses.



The new Acme Automatic Model No. 200 fully automatic high frequency plastics welder. Made by HF Industrial Services Ltd.

High Production Rate

A quite high production rate is claimed for this new machine. A figure of 16 cycles per minute is obtained with the aid of very high frequencies which also means the elimination of flash, often such a troublesome problem.

The high frequency generator is a development of their original cavity type, the welding electrodes and oscillator valve being water cooled, an important feature for continuous production. For intermittent work cooling takes place between cycles, but this is clearly not possible with continuous production. The cooling also means considerable economy in valve replacement costs.

Another economy feature is the stabilized metal rectifiers expected to give a trouble free life of 15 years.

Basic Construction

The new model, known as the Automatic model No. 200, has a power rating of 6kW. and a standard platen size of 24in. between press guides by 30in. in the direction of traverse, and it will handle material from 0.004in. thickness upwards. Other sizes of platen will be made to order.

The Automatic consists basically of a press and generator, the press frame being a welded fabrication of rolled steel sections. The standard model is hydraulically operated by means of a self-contained Vickers/Stein Atkinson unit. Pneumatic operation can also be provided if required.

The mechanism for transferring the material is electrically driven and completely interlocked with the press and HF generator. The length of traverse can be adjusted between 6in. and 30in., the accuracy being very great. Separate process timers are incorporated for weld and dwell cycles.

A three-reel take-up stand is included as standard equipment and is built in as an integral part of the machine. The size of reels can be 24in. wide by 11in. diameter and two reels can be used of 15in. diameter. Rapid change of reels can be effected, a time of 90sec. being quoted.

Method of Operation

Although the machine is automatic the electrode can be inched down by push button. This makes the mounting and levelling of large electrodes very simple and it also allows the position of articles to be welded to be checked to ensure that they are properly located.

The maximum 6in. press stroke is adjustable to minimize the time cycle, but full opening can be achieved by pressing the over-riding push-button. Control is simple with a three position and off switch. This provides for: 'Press Only' — with or without HF power in which the press can be operated up or down by means of the appropriate push-buttons. 'Transfer Only' — when a single transfer cycle follows the pressing of a push-button. 'Continuous Automatic Operation' — by pressing the auto/run button.

There are both human and product safety mechanisms on the machine. The pressing of an emergency palm button during any part of a cycle immediately removes HF power, fully opens the press and stops the transfer mechanism.

As far as the machine is concerned, a most useful feature is that welded articles are not separated from the barrier until 'frozen' into their flat form, thus ensuring reliable stripping of the finished product, whether thin or thick material. Another useful point is freedom from 'snarling-up' around the stripping blades or rollers and improved finish of the welded edges.

Marking Plastics Tubes

The Markmaster tube measuring and marking machine is a completely automatic, electronically controlled, air-operated machine made by Markmaster (Trading) Ltd. It will mark plastics tube at measured intervals as it is extruded, simultaneously measuring the length.

The mark can be in any colour, is absolutely permanent and the pro-

Continued on page 326

Speeding Railway Modernization

WITH POLYESTER MOULDS FOR CONCRETE CASTINGS

AT a British Railways concrete works at Exeter, where approximately 100 tons of concrete castings are produced every day, trials with moulds made from polyester resin, reinforced with glass fibre, have been an outstanding success. Various items are produced at the works for the railway modernization programme.

The advantages of plastics over metal moulds, which are also used for precast concrete, are: lighter weight, which facilitates stacking and speeds production, and easier removal of castings in cold weather.

Making concrete cable conduit covers from polyester moulds. The light weight of the moulds makes stacking easier and speeds production

Each of the moulds has produced over 250 castings and shows no sign of wear. A mould life of 2,000-3,000 castings is now expected.

Conventional timber moulds produce no more than 300 castings before requiring extensive repairs — which may cost as much as the original moulds.

Because reinforced-plastics moulds are one-piece and have a hard surface, mould joins and surface damage, which normally scar concrete castings made in timber moulds, are completely absent.

Items produced in plastics moulds at present include covers for cable conduit, concrete numerals, ornamental balustrades for the repair of a viaduct, and fencing posts complete with base plates.

A Bakelite polyester was used in the production of the moulds.

This Viking cistern is made entirely of plastics, inside and out. The inside is moulded from Tufolene, and the shell from high-impact Styron 475 M polystyrene made by British Resin Products Ltd. Viking cisterns are made by Cisterns Ltd., Addingham Ilkley, Yorks.

Cups by the Million

Conex all-plastics vending cups are now being produced in the UK by ITW Ltd., Slough. Several hundred million of these cups have already been made and used in cities throughout the USA, with sales increases of as much as 10% reported in many cases.

Formed from British Resin Products Ltd.'s Styron polystyrene, design features of the cups make for accurate flow through vending mechanisms and ease in holding. Primarily for automatic machines, the cups are also suitable for counter dispensers, and all types of catering.

Easy Sliding Doors

Creators Ltd. has produced a door runner section in rigid pvc. This has always been a problem to the furniture industry, but the new runner section is claimed to ensure smooth gliding movement together with ease and reliability.

The section can be produced in various channel sizes, straight lengths, or pre-formed to fit any particular design of furniture, whether it be for television cabinets, kitchen cabinets, cocktail cabinets or any type of furniture incorporating shutters.

I.C.I. Develops VDC Barrier Coatings

A range of vinylidene chloride copolymers with important applications in packaging has been developed by I.C.I. plastics division. These copolymers — called Viclan — are said to provide new barrier coatings for packaging materials such as paper, board, cellulosic film and metal foil.

Packaging materials coated with Viclan are claimed to have excellent resistance to oil, grease and solvents, and remain impermeable to water, water vapour and gases. The coatings are flexible, have negligible residual odour and can be heat-sealed. The copolymers are available as latices or as dispersible powders.

Fortiflex Signs

The General Rubber Goods Division of Dunlop is making road signs from Fortiflex (a compound of natural rubber and phenolic resins).

In addition to a range of black, unpainted road signs, a new three-panel triangular sign has been introduced. This is in yellow, with black letters moulded into it.

The sign is made in three separate panels, curved at the edges and fastened to each other by rubber grommets so that the signs can be stacked inside one another or taken to pieces for storage.

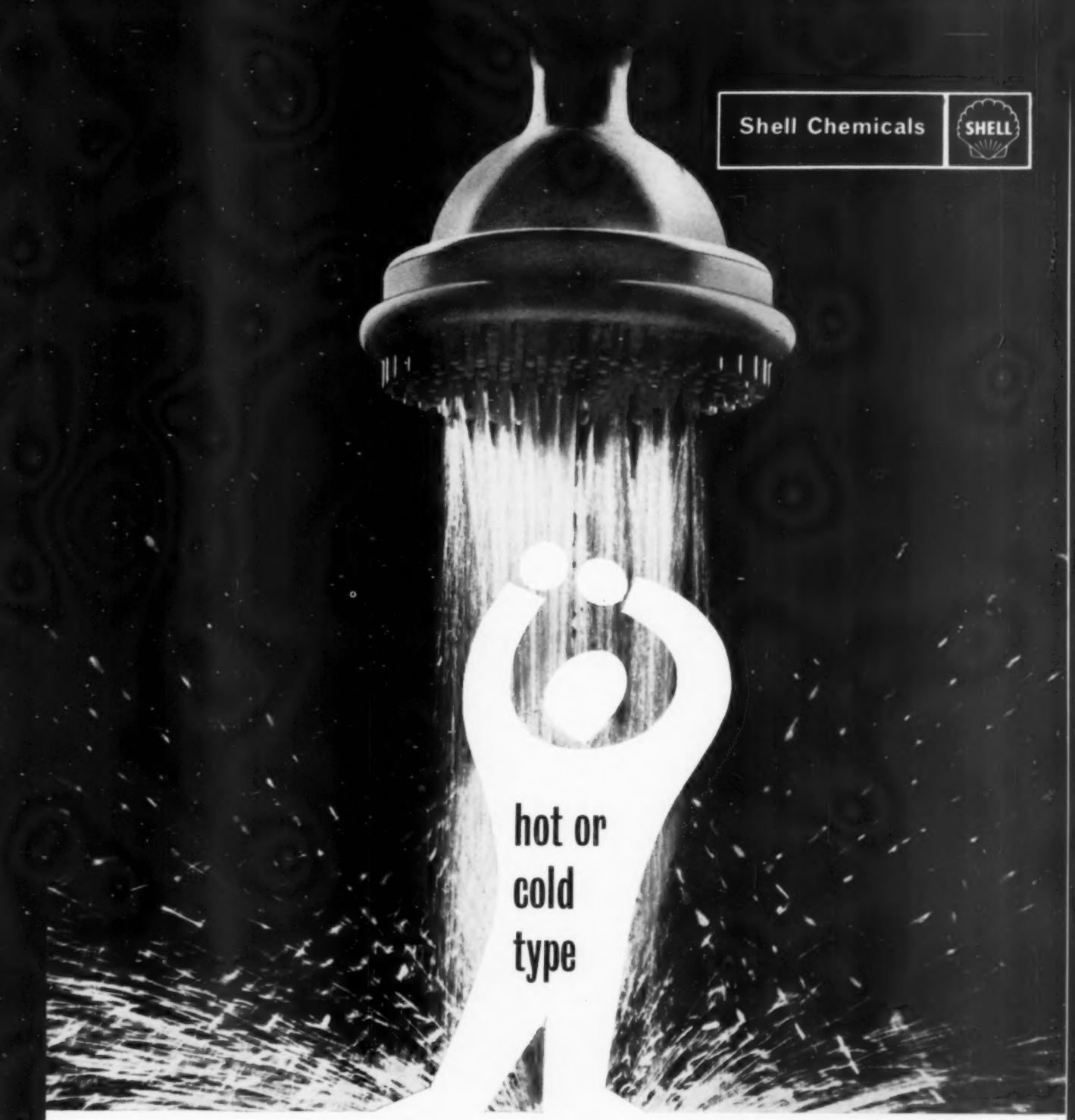
Plastics Machinery Developments

Continued from page 325

gressive length can be marked on the tube if required. The colours, which are fed automatically, are fuse printed on to the tube and are perfectly dry at all times so that they cannot off-set or smudge.

In the case of tubes it is obvious that if any pressure is applied the tube will be distorted. To avoid this the machine moves with the tube during the marking process which is accomplished in a fraction of a second, the die and tube travelling at precisely the same speed in the same direction. The rate of travel may, of course, be adjusted to suit the speed of the extrusion.

The distance between each mark may be pre-set to any desired length and is accurate. The range of sizes of tube which can be accommodated are from ¼in. up to 6in. To install the machine only a bench, air and electricity supply are required. The air pressure required is 60psi and the progressive numbering head measures 0-9,999ft. and may be re-set when it has reached any total.



'Cariflex' is never lukewarm when it comes to supplying suitable hot or cold synthetic rubbers to stand the wear and tear of household usage. Where whiter whites and brighter brights are needed, there you will find 'Cariflex' SBR types* and the new 'Cariflex' Isoprene Rubbers, decoratively employed as tap swirls, shower-bath and washing machine fittings, flooring and many other uses. 'Cariflex' resists discolouration and ageing, is durable, easily moulded and a wide colour range can readily be achieved. For household articles, as for many other applications, 'Cariflex' is the right rubber for the job.

*S 1502, S 1509, S 1707, S 1006, S 1009.

For further information consult your Shell Company (in the U.K., apply to Shell Chemical Company Limited, Plastics & Rubbers Division, 170 Piccadilly, London, W.1)

Cariflex
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SHELL-MADE RUBBER

VIEWS and REVIEWS

The Philosophy of Galloping Change

ONE of my constant themes, appearing in many forms, is change, and especially the climate of change brought about by technology. So rapid is the increasing rate of change, that I have even looked forward to a time (not impossibly far ahead) when the whole system may break down because we prove unable to change our minds quickly enough.

It is quite obvious that our political theory and practice, in Europe at least, lags behind our scientific and technological abilities; our politicians seem unable to make use of our new powers and constantly seek to impose restrictions on them. Plenty but for politics, may turn out to be the epitaph on our times.

Change in Industry

In our industry, now in a phase of rapid change in raw materials and processes, one of the pre-occupations of boards of directors ought to be to manage change, development, invention, innovation. That may be so, but I am surprised to find that even some higher managements do not understand the policy in this direction of their directorial boards.

In some firms, no doubt, it is the aim of the directors, deliberately or unconsciously, to leave the formulation and implementation of day-to-day management policy to a free-for-all. Inevitably in such circumstances, political manoeuvring becomes the main obsession of lower management and gives rise to an intricate series of moves and counter-moves aimed at status-raising but resulting in internal conflict to the detriment of commercial progress.

There is inter-management rivalry in most firms and it can be almost wholly good, if company policy be clearly enunciated. In the present context, that means that all managers must be clearly informed on the company attitude to change and especially to the impact of technological development on the company.

The Management of Innovation

A detailed inquiry into the pressures put on industry by external and internal changes and development is reported in a recent book, 'The Management of Innovation' by Tom Burns and G. M. Stalker, published by Tavistock Publications.

The authors feel that an organic or dynamic organization instead of a static one is the only way to meet the challenge of change. In that type of organization, the role of the managing director is still pre-eminent and, primarily, it is to discover, to interpret, and to inform his subordinates of the ever-changing technical and commercial situation.

As the rate of technical change increases, so does the number of occasions demanding quick and effective interpretation to the working force.

Individual and Firm

Consider the individual in an industrial - commercial system. Though but a part of it, he sees it revolving around him and he often evaluates its parts by how far they traffic with him.

There is a sense, of course, in which every individual in the organization has a complete job to do and in order to do it effectively must exploit the work of others, not only subordinates.

In stable conditions, subordination is accepted and acceptable, a man is left 'to get on with his job', but, in changing conditions, it is a hindrance. 'When the individual is involved in the bigger, more active communication network required for faster technical and commercial change, he is more fully implicated as a person, more committed, more involved. The notion of subordination itself becomes less tolerable and is often rejected, or set aside by collusion between the members of the organization'.

This makes more demands on each person. 'In general terms, they are required to surrender the safe determinacy of a contractual relationship with the firm for one in which their obligations are far less limited, to replace a view of the firm as an impersonal, immutable boss by one which regards it as something kept in being by the sustained creative activity of themselves and other members, to cease being "nine-to-fivers" and turn "professionals" '.

Overcoming Resistance

There is often strong individual resistance to this process, involving harassing, even bitter, anxieties, animosities, and frustrations. A climate or tradition must be built up to enable criticisms to be voiced and suggestions made without offence being given or taken.

'What is essential is that nothing should inhibit individuals from applying to others for information and advice, or for additional effort. This in turn depends on the ability to suppress differences of status and of technical prestige on occasions of working interaction, and on the absence of barriers to communication founded on functional preserves, privilege, or personal reserve'.

If by reading 'The Management of Innovation' anyone expects to be taught how to organize a research or development department, he will be disappointed. The book is, incidentally, concerned with that, but it faces up to the wider challenge to modern industry, what I have called the challenge of change.

Perhaps the book is too diffuse, too analytic, too detailed, but it is pioneering new country and much must be forgiven for that. It has some fresh and fertile things to say, if you look for them. It is, in a sense, an English version of 'The Organization Man'.

It goes further than that book and grapples with the overt and the psychological elements in the production-technical situation. For instance, the investigators, having heard the two sides described as 'long-haired types' and 'production clots', sum up the situation in this way: 'In the laboratory, virtually all members of design teams had a common professional status entered by clearly defined channels of professional qualification by examination, a common educational background (in some firms, the usual term for a qualified member of the laboratory staff is "a graduate") and often common interests and recreational pursuits learned in universities and technical

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

colleges. Above all, they possessed in common a distinctive language and system of values by which achievement was measured. On the production side and in general management the men who had risen from the bench into management, the ex-officer trainees, the arts graduates, the accountants, production controllers, and technical and non-technical salesmen formed a far more heterogeneous system'.

But, the authors cogently argue, these cultural differences are not fundamental. 'What we had not grasped was for people, when faced with problems in human organization of an intractable nature, to find relief in attributing the difficulties to the wrong-headedness, stupidity, or delinquency of the others with whom they had to deal. . . .'

In the face of change, these petty charges must be dropped and somehow a statusless system evolved.

Change and Decay

Change often goes about with its twin brother, decay. Together, they are one of the chief subjects of study by our technologists. A. Kh. Iablokoff, Head of the Research Division of ONERA, reports in *Industries des Plastiques Modernes*, Vol. 13, No. 2, pp. 25-30, on some of the changes which take place in glass-fibre-reinforced, polyester-resin laminates, when aged naturally and artificially.

He compares the results of ageing under three different sets of conditions: (1) natural, shelf ageing in a controlled atmosphere of 20°C. and 70% relative humidity, (2) natural ageing on a roof in Paris, and (3) artificially accelerated ageing in a stove at 70°C. and 100% relative humidity.

In shelf ageing, the tensile strength was practically maintained during the two years of the test, and there was only a slight fall in a flex resistance. Cold polymerizing gave products which were a little more resistant to shelf ageing than those made by hot polymerizing.

In roof ageing, winter conditions had a more marked effect than summer conditions. 'It seemed that a higher humidity (snow, rain, fog) even at lower temperatures increased the degradation more than the infra-red and ultra-violet rays of direct sunlight'. 'It appeared from these observations that laminates exposed to the weather should be protected by a suitable paint'.

Flexing tests also showed a reduction caused by weathering but this was greater during the summer and was brought about by erosion of the outer, resin skin.

Correlating Results

Accelerated ageing reduced the tensile strength by 40 to 50%. Hot-polymerized products showed a somewhat greater resistance to this artificial ageing than those polymerized cold. Losses in mechanical properties were rapid at first but then became stabilized.

Iablokoff comes to the conclusion that, despite some differences in the mode of ageing, a fortnight of accelerated ageing was equivalent to six months on the roof.

Considering the different modes of attack brought about by the heat and the humidity of the accelerated ageing conditions compared with exposure to the weather, the conclusion is reached that: 'Heat and humidity affect the glass-resin interface, while the other climate factors (UV light, wind, and the electric charges on raindrops) act upon the resin itself'.

There is some evidence of post-polymerization during ageing, very slow and limited on the shelf, more rapid on the roof, and 'quite brutal' in the oven.

The Mole Changeth

Under that heading, *Materials Research and Standards*, Vol. 1, No. 5, summarizes on page 404 an article by E. A. Guggenheim in the *Journal of Chemical Education*. It shows that even at the level of our ideas of the weights of atoms there is change.

Last year, a new atomic scale was officially endorsed by the International Union of Pure and Applied Physics. It is based on $C^{12}=12$. Previously, their scale was based on $O^{16}=16$. The chemists' scale was slightly different, being based on naturally-occurring $0=16$, and naturally-occurring oxygen is actually a mixture of three isotopic forms of 16, 17, and 18. In the old chemical scale, O^{16} worked out at 15.99560.

It is the intention of the International Union of Pure and Applied Chemistry to come into line and introduce the new scale at its summer meeting this year in Montreal.

For chemists, the change will amount to 43 parts per million. 'The change also provides an occasion for tidying up nomenclature related to the scale. The term "atomic weight" has long been confusing to the student; it is hard to explain that this is not the weight of an atom. It is hoped that the term will fall into disuse.' While the mole changes, atomic weight decays.

In Praise of Zest

I have some excuse for adding a personal postscript this week. This is the fifty-second of my 'Views and Reviews'.

Everyone likes to be praised, and I am very glad that although there have been brickbats, they have been more than outweighed by the bouquets.

From the latter it appears that the freshness of subject matter that I often tried for has been recognized. There is wide acceptance that 'comment on scientific and industrial matters' should deal with the things in which scientists and industrialists are interested, and I know, all over the world, these people are interested in more than is narrowly imprisoned in the words 'science' and 'industry'.

The quality of a man's laboratory or factory work, as I have often seen in practice, can be strongly influenced by his extra-mural thinking.

An underlying theme of these columns is the belief that for scientists and industrialists there is just a little more than science and industry, and that I hope that that little more will show, now and again, in the next 12 months of 'Views and Reviews'.

CHARLES JENNINGS

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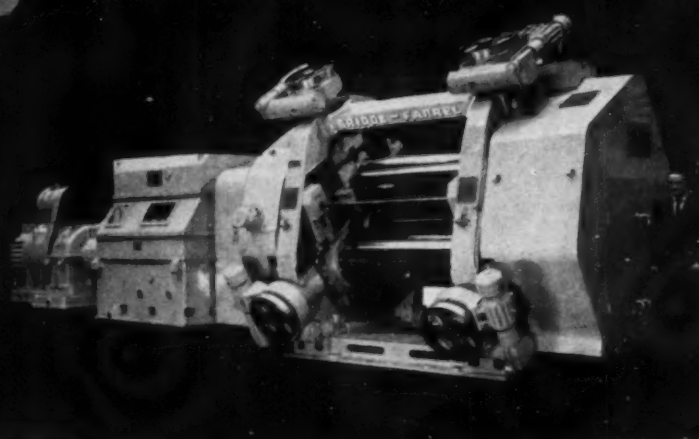

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MEN and MATTERS

A Review of People and Events

by Peter Richards

THE Rubber Manufacturers' Association Inc. in the USA has been worried for some time by reports from tyre manufacturers of isolated instances where car tyres have been torn apart by internal explosions. All of these cases seem to occur during winter and in the colder areas of the country.

The association has told me the results of some of its detective work on this peculiar problem.

Apparently in the colder areas some garages use alcohol- or methanol-base anti-freeze solutions in their air compressors to prevent the air lines from freezing. The resulting gaseous mixture enters the tyre under pressure during inflation and evidently can be detonated by a spark of static electricity.

The association also says that some commercial rubber lubricants contain a high percentage of combustible solvent and when used to lubricate tyre beads or rims can produce an explosive mixture with air.

So far there has been no fatality from the few tyre explosions which have been reported but there is obviously always the chance that such an explosion could occur in a large truck tyre, where the hazard would be much greater.

As a result of these investigations tyre companies are now stressing that a flammable anti-freeze solution should never be placed in an air line or air compressor and that no material which contains a flammable solvent should be used as a tyre or rim lubricant.

That Know-how Offer

The three-page advertisement by the US concern RO-Search Inc. in *RPW* last week has aroused much interest. In this Ro-Search, a pioneer in the field of direct vulcanized footwear, offered to discuss the availability of its technical know-how in the field of sponge rubber soled slippers and casuals with a limited number of UK firms.

Ro-Search, of Waynesville, N.C., is owned by the same family who used to own Rollman and Mayer and Romika in Germany until these were expropriated by Hitler in 1935. Rollman and Mayer and Romika employed an average of 3,000 workers and had a daily production in excess of 20,000 pairs. Romika, as might be remembered by some of the senior members of the trade, was one of the largest exporters of fancy vulcanized shoes, as well as wellington boots, from Germany to England.

Heinz Rollman, third generation member of this old shoe-making family, and president of Ro-Search, says he well remembers orders from one multiple alone amounting to almost half a million pairs a year. When the £ was devalued, the former owners of Romika seriously considered starting their own factory in the UK. However, these plans were thwarted when Hitler came to power.

Mr Rollman adds: 'A number of our best English customers offered us large sums of money to start a factory in England which would be directed by the Rollman family, while the share capital was to be owned by these customers of Romika. This plan was abandoned in favour of signing up with Pirelli, who received on an exclusive basis, for many years, all the know-how and experience, both technical and commercial, from Rollman and Mayer and Romika and its successor companies. These were Rollman, Kaufman and Co. of Belgium, and subsequently, Ro-Search incorporated in the USA'.

Ro-Search has know-how agreements throughout the west and assists manufacturers in the making of shoes with sponge rubber soles, one of the patents developed by the family.

The Ro-Search group claims that they made the first leather shoes to feature direct vulcanized soles and heels. They manufactured, at Rollman and Mayer plants in Germany as many as 5,000 pairs a day from 1932 to 1935. The company is now said to be working on new revolutionary processes — but this will not be ready before 1965.

Sanders of West Byfleet

For those commuters who have a secret yearning to come back from the City and play Sanders of the Rivers in absolute comfort, Floating Homes Ltd. has added a new, wider, house boat to its range. Boats of these series will be constructed on the Basingstoke Canal, West Byfleet, Surrey.

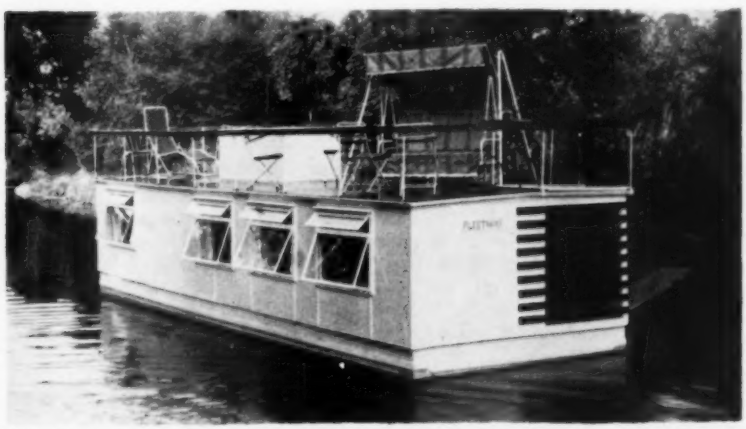
The hull is built of wood, covered with a skin of epoxy glass. Rubber and plastics also plays a part inside. Warerite decorative laminate is used for working surfaces, and the City Sanders treads a deck of pvc floor tiles and sleeps on special latex foam mattresses made by Vitafoam Ltd.

This model — the Mark II — contains a saloon, double bedroom, galley and bathroom.

All the company's floating homes are available on a four-year mortgage. Cost of this model? £1,900. Ground rent — sorry, mooring fee — is £40 a year.

Do It Themselves

Audience participation will take on a new meaning at Formica Ltd.'s stand at the Do It Yourself Exhibition



What little sun we have in this country is caught in the roomy sun deck of this 'floating home'. The hull, which is 32ft. by 10ft. wide, has an epoxy glass skin, and the houseboat contains pvc floor tiles, decorative laminate on working surfaces and latex foam mattresses. *(See: Sanders of West Byfleet)*

at Olympia which opens on August 31.

The centre-piece of the Formica stand will be a large demonstration area with a platform and plenty of room for the audience around it. Small, quickly made and ready to use articles will be simply constructed. Although there will be a full team of demonstrators, Formica intend to let the public loose in the area — so that they can do it themselves as much as they like.

Ode to a Suburban Lamp Post

Short statements chalked on lamp posts bother local councils. Hardly surprising. Only trees available for suburban lovers. But now local councils can relax. Because now — dog and hooligan - proof lamp - post. Smooth. Polished. Coloured throughout — polyester glass. Weighs only as much as my typewriter x 2. Good for wayward car drivers, too. Stands considerable impact. Reduces damage. Developed by Dudley, Worcs., firm, A. C. Ford Ltd. Beetle polyester resins by BIP Chemicals Ltd. X. Lovers love plastics.

Plastics Man New Monsanto MD

Following his recent illness, D. R. Mackie, at his own request, has resigned from his position as managing director of Monsanto Chemicals Ltd. with effect from October 1. He will continue as a member of the board.

Mr Mackie will be succeeded as managing director by John C. Garrels, Jun., deputy managing director, who has been actively carrying out the duties of managing director since Mr Mackie's illness in March. Mr Garrels joined Monsanto Chemicals Ltd. from the Plastics Division of its American parent company at the beginning of 1961.

Tension and Barbed Wire

Tension and barbed wire in Berlin do not seem to have affected the arrangements made for the Leipzig Autumn Fair (September 3-10), where a number of UK polymer firms are to exhibit.

Earlier this month 145 permit applications had been received compared with 95 in 1960 and a spokesman said it seemed likely the 1960 figure of 253 would be exceeded.

There have been no cancellations by British exhibitors and Sabena and KLM, who are running through flights from London to Leipzig during the Fair, report satisfactory bookings.

Twenty-three UK firms will be represented at the Autumn Fair compared with 20 in 1960. The Fair will cover over 1m. sq. ft., an increase of 20% on last year.

A. B. Merriam has been appointed to the board of Halex (Division of the British Xylonite Co. Ltd.) as production director. Mr Merriam has been works manager for the past three years

THE LEGAL ANGLE

An On-the-Spot Decision

By a Barrister

'Our salesmen sometimes have not the same power to take on-the-spot decisions as their competitors. . . .' (RPW, July 15 1961.)

One reason why salesmen are not given so much power is the fear that they might abuse it. After all, a salesman's triumphs may be the making of your business, but his mistakes may prove its ruination.

Take the case, for instance, of a gentleman who placed an order for plastics sheeting, in accordance with an out-of-date price list. His company realized that they would be left with the deal, if the salesman himself could be held to his mistake, had he been making the contract on his own behalf. But could he? When are we bound to stand by our mistakes?

The answer all depends, normally, on whether the mistake is incorporated in an offer or only in an 'invitation to treat'. Where retailers mark goods with a price, they are not making an offer which the public can accept. They are simply inviting the public to inspect — saying, in effect, 'Please come and make us an offer for the goods. The price we are likely to accept is £x'. Equally, if you send round a price list or specify a price in an advertisement, the chances are that this will also be treated as an invitation to treat, and that you will not be prevented from saying to enquirers: 'Sorry — prices have gone up', or, 'I am afraid we made a mistake — in fact, the price is higher'.

But now suppose that the customer actually says, 'I'll buy the goods at the specified price'. He may think he is accepting your offer — but he probably is not. What he is doing is making you an offer himself. If you then say — either personally or through your agent — 'Very good. We will sell at that price', that is the end of it. The deal is done. The fact that you have made a mistake is your own misfortune.

A Misapprehension

True, if you had both been under a misapprehension of great importance — as where the salesman purported to sell goods which, while neither he nor his customer knew it, did not, in fact, exist — the deal may be a nullity. But where there is a unilateral mistake, both sides are normally bound.

So when your representatives can make on-the-spot decisions, let us hope that they do not make mistakes. While a mistaken invitation may do harm to your goodwill, a mistaken offer or acceptance can cost you even more.

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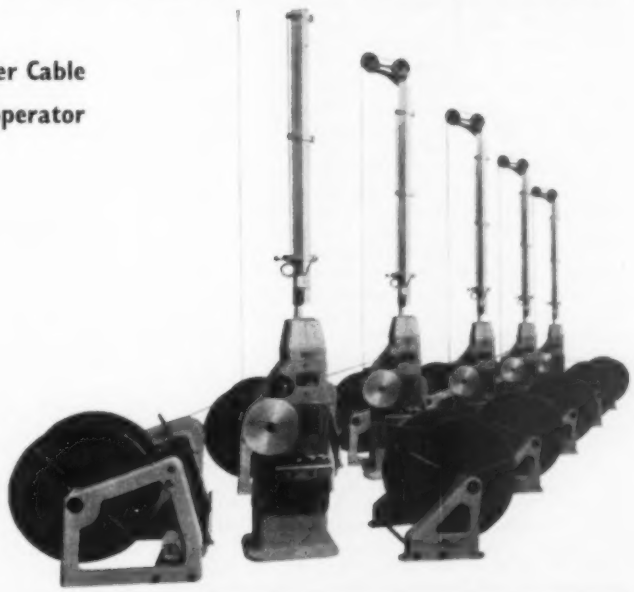

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D1

Plantation Newsletter

NUPW WANTS REASONABLE WAGE CONCESSION—QUICKLY

by our Malayan Correspondent

FROM KUALA LUMPUR

REPRESENTATIVES of plantation workers and of the MPIEA (Malayan Planting Industries Association) will start their discussions this month on wage claims by the Union. How long these talks will last is anyone's guess.

The National Union of Plantation Workers submitted a memorandum in April and the MPIEA gave their views and proposals earlier this month. So far, however, both these documents have not been made public.

In a statement, the NUPW said that some of the proposals regarding 'classification of trees' had to be referred to their branch organizations for consideration and warned that it might be some time before an acceptable formula could be finally agreed.

Even so, the NUPW has made it clear that it has no intention of prolonging the negotiations and hopes that the MPIEA will also not yield to any temptation of stalling.

The NUWP said: 'With regard to the prospects at the negotiation table, we can only say that if the employers do not want to face wage demands every now and then, it is advisable for them to make reasonable concessions which are acceptable to the union quickly and then come to a mutually acceptable period of duration for the agreement.

'Now, as there is no Emergency and expenses connected with the Emergency are a great saving for the industry and also the yield per acre has gone up three or more times because of replanted new material in considerably large areas, we do not expect the employers to do any tough bargaining.

'But if they ask for it, we will naturally rise to the occasion. Further dates on the negotiation will be mutually agreed upon depending on the progress we make after the first meeting'.

The last agreement reached between the MPIEA and the NUPW was signed in 1958. There was a clause in this that either side could give three months' notice of its intention to suspend the agreement and reopen new talks. This is what the NUPW has done.

Sliding Scale

In the last agreement, a basic wage was agreed to for plantation workers on top of which they received a sliding scale of bonuses depending on the price of rubber. Now that the price of rubber has been well below the $1 a lb. mark for many months, the Union has seen fit to seek a new agreement.

Recently, the Selangor branch of the NUPW called on the Malayan Government to levy a special tax on every lb. of rubber produced in this country, the funds of which should be accumulated in a special reserve for the support and welfare of workers on plantations.

Since this call was made, however, there has been no reaction either from the Union headquarters or the Government, so it is possible that it will not be taken seriously.

But there seems little doubt that union officials will raise the question of temporary estate managers when they meet MPIEA officers at their round-table wage talks.

For some time now there have been occasional complaints of acting estate managers being 'too high-handed' in their dealings with plantation workers. Responsible union officials feel that this matter can be well sorted out without much ado if greater care is taken by estate managements before placing in a position of authority persons who are likely to abuse such positions.

A Boost for Rubber

The new trade pact signed between Singapore and Indonesia will boost the rubber industry of the two territories, according to J. Loontgens, a company director of Socfin Rubber and Palm Oil Plantations, who has just spent two months in Sumatra.

Singapore does extensive trade with Indonesia and the Government has just despatched two officials to establish a trade mission in Djakarta.

The extent of the rubber trade alone can be gauged from the fact that in the first six months of this year, 160,000 tons of rubber were imported into Singapore from Indonesia. Of this, 90,000 tons came from Sumatra.

The value of total imports from Indonesia in the first four months of 1961 totalled $274m., according to official statistics. 17% of Singapore's total external trade is with Indonesia, while Indonesia earns 20% of her foreign exchange through her trade with Singapore.

Socfin plantations have about 100,000 acres in Sumatra, producing some 12,000 tons of rubber a year and 30,000 tons of palm oil. This company, too, has large holdings in Malaya.

Government Selects Smallholders

Five smallholders are to be appointed by the Government to sit on the Rubber Industry (Replanting) Board. In the past, smallholders sat on this board but they were selected by the Council of Rubber Smallholders' Associations, which it has now been decided is not a fully representative organization.

So in future they will be selected by the Government. The names of 12 smallholders have now been submitted to the Ministry of Commerce and Industry.

Peco at Brno

For the third consecutive year Peco Ltd. is to exhibit at the Brno Trade Fair in Prague (September 10-24).

The company's 40 MR machine — one of the six models in its latest Rotothrust screw preplasticizing range — will be featured. Peco recently negotiated a contract worth £40,000 for this model with Strojimport of Prague.

Throughout the exhibition moulding demonstrations, producing a bowl in high density polythene, will be given.

Rubber Statistics

MALAYA — JAPAN

MALAYAN shipments of sheet and crepe rubber declined to 85,931 tons in July from 87,302 tons in June.

According to official figures released in Singapore of the latest total the UK took 11,703 tons, the USA 8,245, West Germany 7,755, Japan 9,471, the USSR 16,364, China nil, other European countries 16,644, other Commonwealth countries 7,607 and other countries 8,142 tons.

Latex and revertex shipments totalled 8,244 tons in July against 8,002 tons in June. Of the July total the UK took 1,319 tons, USA 828, West Germany 743, Japan 1,719, the USSR nil, China 20, other European countries 2,391, other Commonwealth countries 517, and other countries 707 tons.

Japan

The Rubber Manufacturers Association in Tokyo has announced that the production of rubber articles during June amounted to 20,102 tons, compared with 19,066 (revised) tons in May and 17,701 tons in June 1960.

A breakdown of the June output of the main rubber articles with comparable May figures (revised) is as follows:

	1961		1960
	June	May	June
Motor car tyre tubes	9,548	8,833	7,480
Bicycle tyre tubes ..	703	717	882
Rubber-soled canvas shoes	1,020	1,069	1,006
Rubber shoes ..	1,416	1,304	1,464
Belts	1,320	1,131	901
Industrial uses ..	2,700	2,651	2,232

Plantation Share Survey

THE chairman of the GOLDEN HOPE RUBBER ESTATE group deals with the topic of 'natural versus synthetic' in his annual statement to shareholders. Sir Eric Macfadyen, one of the leading rubber experts in the City at present, says that competition between the two varieties is in the main going to be price competition and it will then be seen that the company's competitive costs will keep it in the picture as rubber producers. He points out that the styrene-butadiene synthetic producers will certainly feel the competition from the new stereospecific types more than he thought they would from the natural producers. It is significant that some of the manufacturing interests financing the manufacturing of stereo are at the same time spending large sums on extending their plantations both in the East and also now in Africa. At present, he goes on to tell shareholders, a quarter of the American SB facilities are standing idle, the demand for the commodity having been outrun. Natural rubber, on the other hand, sells readily and in the past 12 months 'its price has only been kept within bounds by heavy releases from Government stockpiles'.

Crops Good

As far as the current year's results are concerned, Sir Eric stresses that these will depend on market prices for both rubber and palm oil. However, crops harvested in the first quarter 'have been good and look like being better over the remainder of the year'. The average price of 27d. per lb. realized for the year to end of February 1961, is not likely to be repeated. During 1960-61, 582 acres of rubber and 373 acres of palm oil, both made up of selected strains, came into bearing. Over 1,000 acres were planted, in part new plantings but largely replants. In the current year 1,428 acres, mainly replants are in hand and when these are completed 85% of the group's plantations will have been modernized. 'We can look to modern areas maturing by annual stages up to 1968'. It is also pointed out by the chairman that the very promising investment made in the Sogomana Group since the year-end will be reflected in the year's accounts.

Indonesian Subsidiary

Holders of LARAS (SUMATRA) RUBBER ESTATES income debentures have been circulated recently and informed that it appears to be in their interests for the company to form an Indonesian subsidiary to which the Indonesian assets could be transferred to comply with the new agrarian law of that country. The company has been advised that there is only one alternative open to it which appears to entail the loss of the Indonesian estates completely within about four years and may also imperil the company's position in regard to all remittances. Accordingly, it is proposed that the debenture holders should appoint a committee consisting of R. G. Harding and J. R. Talbot and co-opt S. A. Dohm as a third member, if willing. The committee will have the power to examine the whole matter in conjunction with the company and with the trustees. The debentures are secured upon the company's Indonesian estate by a specific charge and also by a floating charge upon all other of the company's assets. In the event of the committee deciding that the Indonesian estates should be transferred, it is then intended as far as Indonesian law permits that the share capital of the Indonesion company should be charged to the trustees as security for the debenture holders.

Down Mincing Lane

Meantime down along Mincing Lane the price of rubber seems to be holding fairly firm at a little under 2s. 1d. a lb., although it certainly must be admitted that the underlying situation provides not a lot of encouragement from the optimists. Some of the support which has come from Eastern quarters was based apparently upon the chance of a £ sterling devaluation move. But this threat has, of course, been removed by Selwyn Lloyd's 'little budget' and the rise in the Malayan Bank rate from 6% to 7% has made financing of the heavy Malayan stock more costly. On the consumption side, too, the latest figures are not calculated to revive hopes of an early strengthening of the statistical position. Last month the ratio of natural consumption in total new rubber usage in the United States reached a new all time 'low' of under 28%. The natural/synthetic ratio for the first six months of the year works out at 28.5% compared with 31.9% in the same period of last year, and it is significant to note that this year's reduction in total new rubber consumption has been much more severe in the case of natural which is lower by 22.2% than synthetics, the absorption of which has fallen by 8.8%.

Latest Take-over

Take-overs continue to play an important part in plantation affairs. Latest in the field is CONSOLIDATED SALAK RUBBER with rubber areas of almost 10,000 acres in Negri Sembilan. It has made an offer to purchase practically the whole of the Perak estate of over 1,000 acres owned by the sister company, GEDONG (PERAK) RUBBER. The purchase consideration of 560,000 consolidated shares plus £18,800 cash has been provisionally accepted by the directors of Gedong who, with their associates, hold 38% of the issued capital of £60,800.

PI News

German Technical Films

THE two German films shown for the first time with English commentary at the recent Plastics Institute Education and Training Conference, may be borrowed on application to Dr Brigitte Lohmeyer, Embassy of the Federal Republic of Germany, Chesham Place, London, S.W.1. The films, which are both in colour, are called: 'Plastics — Their Structure and Properties' (17min.), and 'Plastics — Their Processing' (20min.).

Graduates

The Council of the Plastics Institute has made the following awards: Graduateship: J. M. Layton, D. S. Morgan, and K. Shelley. Associateship: K. P. C. Carter.

PI Examination 1961

Candidates who completed the educational requirements for Associateship, Graduateship, and for the Diploma in the 1961 Plastics Institute Examination are:

Associateship

C. J. Barker, R. Brinson, R. W. Burke, I. A. Campbell, J. V. Dahinton, T. G. Freud, A. J. Kennedy-Ripon, R. W. Little, R. Mather, P. R. Matthews, F. C. Morley, A. C. Morris, A. Rutherford, J. Rys-Sikora, R. E. Williams and P. V. Wilson.

Graduateship

G. D. Heath, G. D. Hudson, E. W. Ridlington.

Diploma

D. V. Allen, L. A. Alvi, R. J. A. Arnold, A. T. Baden Fuller, A. H. Banks, O. Bell, H. A. Bisset, J. D. Bullen, D. W. Chisholm, F. P. Coppard, R. H. Drummond, E. Donnelly, L. A. Dunning, J. B. Edmondson, Miss P. A. Exley, B. A. Gerrity, R. J. Heddon, A. J. Huskisson, D. R. Jones, G. M. Jones, P. B. Keating, A. J. King, C. H. Lambert, T. B. Lucas, J. W. C. Miller, D. B. Morris, J. D. Patel, R. E. Pole, J. W. Roberts, R. Robson, S. G. Shah, K. G. Sherwood, M. R. Tee, M. G. Thatcher, D. H. Thomas and T. A. Wells.

The provisional dates for the next Plastics Institute examination are June 18-23 1962.

UK Rubber Imports

The International Rubber Study Group announces that UK rubber imports in June totalled 11,181 tons and re-exports 8,986 tons. UK consumption in May totalled 15,100 tons and stocks totalled 37,200 tons.

Rubber Markets

LONDON

Occasional nervous short covering prompted by the continued Berlin tension, and higher prices at Singapore, maintained the recent rising trend. Sellers were very reserved, and buyers had to pay full prices asked. Dealers took producers' offers for 1962, and Continental demand for Autumn shipments enlivened the cif market.

Latest prices are as follows:

No. 1 RSS Spot: 25⅛d.-25⅝d.

Settlement House:

September 25⅝d.-25¾d.

October 25¾d.-26d.

November 26d.-26⅛d.

October/December 26d.-26⅛d.

January/March 26d.-26⅛d.

April/June 26d.-26⅛d.

July/September 26d.-26⅛d.

No. 1 RSS cif basis ports:

September 25⅝d.-25¾d.

October 25⅝d.-25¾d.

Godown:

September. Market closed on August 23. Previous day's price 86¼ Straits cents.

LATEX

Centrifuged 60% latex per gallon in drums, seller, September, October, 14s. 9d., cif European ports. Spot, seller, 15s. 1d. Bulk, seller, d.w. 14s. 8d. Normal, seller, September, October, 11s. 6d.

NEW YORK

The New York rubber market ruled as under on August 21:

DEALERS' PRICES

US cents per lb., ex-dock

	August 21	Previous
No. 1 RSS, Sept.	29⅛b–30a	29⅛b–30¼a
Oct.	29⅛b–29⅜a	—
No. 2 RSS, Sept.	29⅛b–29⅜a	29⅛b–30a
Oct.	29⅛b–29⅜a	—
No. 3 RSS, Sept.	29⅛b–29⅜a	29⅛b–29⅜a
Oct.	29⅛b–29⅜a	—
No. 1 RSS, Spot	30⅛n	30n
No. 3 amber blanket crepe, Sept.	26⅛n	—

FUTURES—REX CONTRACT

	August 21	Prev. Close
Sept. ..	30.40b–30.50a	30.30b–30.45a
Nov. ..	29.90b–30.10a	29.80b–29.90a
Jan. ..	29.60b–29.80a	29.40b–29.65a
March ..	29.50b–29.70a	29.30b–29.55a
May ..	29.50b–29.70a	29.20b–29.40a
July ..	29.50b–29.70a	29.20b–29.40a
Sept. ..	29.50b–29.70a	29.20b–29.40a

Sales: Nil. Tendency: Steady.

Futures were steady in quiet dealings on August 21. Interest was light. In physical rubber, traders reported modest factory buying of September shipment ambers and browns at steady prices. Ribbed sheets were quiet.

SINGAPORE

Prices were marked down at the opening on August 21 in sympathy with overseas advices, but buyers predominated at lower levels and the market steadied in thin trading. Sellers were reserved. Lower sheet interest was small and selective. In the afternoon the market steadied on persistent buying to close at the day's highs. There was selective demand for lower sheet. Sellers remained reluctant. After hours the market closed steady.

Malayan cents per lb., fob Malayan ports to open ports

	Aug. 21	Prev. Close
No. 1 RSS, Sept. ..	86¼–86⅞	86⅜–86½
Oct. ..	87⅛–87⅛	86⅛–87⅛
No. 2 RSS, Sept. ..	86⅛–86⅜	85⅞–86⅛
No. 3 RSS, Sept. ..	85⅝–86⅛	85 –85⅛
No. 4 RSS, Sept. ..	83⅛–84⅛	83⅛–84⅛
No. 5 RSS, Sept. ..	76½–77½	76 –76⅛
No. 1 RSS, Spot ..	86⅛–86½	85⅞–86⅛
No. 3 blanket thick remilled crepe, Sept.	75½–76½	75½–76½
No. 1 fine pale crepe, Sept.	94½–95½	94½–95½
2x thin brown crepe, Sept.	73½–74½	73½–74½

Tendency: Steady.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob, at 169.40d. per gallon.

AMSTERDAM

The Amsterdam rubber market ruled as under on August 21:

Guilders per kilo

No. 1 RMA	Aug. 21	Previous
August	2.36	2.35
September ..	2.36	2.35
October	2.36	2.35
November ..	2.36	2.35
December	2.36	2.35
October/December	2.36	2.35

Sales: Nil. Tendency: Steady.

DJAKARTA

Rupiahs per kilo

	Aug. 21	Previous
Spot No. 1 Priok ..	35.50b	35.60b
Spot No. 2 Priok ..	34.50b	34.50b
Spot No. 3 Priok ..	33.50b	33.50b
No. 1 fine pale crepe, Spot	3.25b	32.00b

Tendency: Very quiet.

CEYLON

The price of No. 1 RSS at Colombo on August 21 was 105½ (104¾) Ceylon cents per lb.

BANGKOK

The price of No. 1 RSS at Bangkok on August 21 was 27.62½ (27.75) US cents per lb.

Calls for Tenders

Terminal Blocks

Plastics block terminals to specification SAPO drawing K.146, Issle 2, are required by the Chairman, Tender and Supplies Board, 291 Bosman Street, P.O. Box 371, Pretoria, to whom bids should be sent, quoting formal tender No. 2711, Post Office. Closing date: September 11 1961. (Ref. ESB/26147/61.)

British Standards

BS 3398
Anti-static Rubber Flooring

Where electrical equipment is used in which the development of a fault could give rise to the risk of electric shock or fire (*e.g.* in hospital operating theatres), it is essential that the rubber flooring, while being sufficiently conducting to disperse static charges, should also have sufficient resistance to limit to a safe value any leakage current from the electrical installation or apparatus through the floor to earth.

Consequently rubber flooring for this field of application must have a resistance lying within a prescribed range with both the upper and lower limits clearly defined. Material with these electrical characteristics is designated 'anti-static' and forms the subject of BS 3398.

The standard covers the composition, workmanship, dimensions and physical properties of the flooring, and also lays down limits for electrical resistance both before and after laying. Advice is also given on the electrical bonding of anti-static rubber flooring.

Copies of the standard may be obtained from the British Standards Institution, Sales Branch, 2 Park Street, London, W.1, price 4s. each.

North British Rubber Co. Ltd.'s display of moulded casuals at an exhibition of Scottish industry in Edinburgh which is now open during the period of the Edinburgh Festival. Lord Primrose, who opened the exhibition, paid a special tribute to North British — for pricing every item on its display

Industry INTELLIGENCE

Technical Data

Sterling V GPF

Sterling V combines in a single grade the modulus of HMF black, the resilience of SRF black and the smooth extrusion and processability of oil furnace black types.

Technical Report TR-8 issued by Cabot Carbon Ltd., Stanlow, Cheshire, presents data on British Sterling V in comparison with British-produced Sterling SO FEF black and the two American-produced gas furnace types, Sterling L (HMF) and Sterling S (SRF).

The report gives in graphical form the 300% modulus, resilience, tensile strength, hardness, elongation and compression set of natural and SBR stocks containing varying proportions of the four carbon blacks mentioned above. Also included are a number of typical formulations using Sterling V together with basic laboratory test results for compounding guidance.

Handling Isocyanates

The increased use of Suprasec E and Suprasec SF in the production of polyurethane foams has resulted in the publication of a leaflet giving information on the handling, storage and transportation of these two organic isocyanates.

This leaflet, Urethane PC/U27, is available from the Polymer and Chemicals Service Department, Dyestuffs Division, Imperial Chemical Industries Ltd. It is intended to be regarded as a supplement to Urethane Chemicals Literature No. 2, entitled 'The Safe Handling of Organic Isocyanates', and deals specifically with the two materials mentioned above.

Foamable Polystyrene

The Montopore range of expandable polystyrenes, is a group of materials that can be processed to yield strong rigid lightweight articles at any density from 1lb./cu. ft. to 40lb./cu. ft.

The material consists of beads of polystyrene or styrene copolymer containing an expanding agent. Under the action of heat, the expanding agent is converted into a gas which creates a pressurized microcellular structure within the softened polystyrene, giving the beads the capacity to expand to many times their original size.

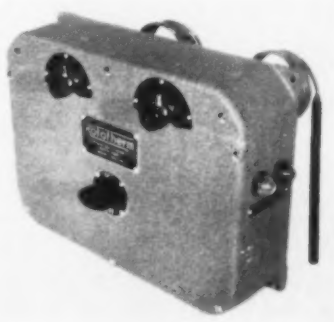
Technical Service Bulletin No. P26/1, published recently by Monsanto Chemicals Ltd., Monsanto House, 10-18 Victoria Street, London, S.W.1, deals with all aspects of processing the Montopore range of products. It describes the present grades available, the various processes in operation today, the type and design of the equipment used, production planning and the methods of finishing the final products.

Machines, Materials and Equipment

Temperature Controller

A new mercury-in-steel, on-off temperature controller, Model No. 1039, which has independent circuits allowing control at any two points through one instrument, has been produced by the British Rototherm Co. Ltd., Merton Abbey, London, S.W.19.

Each of the two controller circuits consists of alloy steel Bourdon tubes,



capillaries and temperature sensitive bulbs, operating mercury switches rated up to 30 amps at 230/250 AC. The differential is fixed but varies according to switching capacity.

Indicator lamps and bottom entry electrical conduit are standard. Temperature ranges are available between −20°F. and +1,000°F. (minimum coverage 100°F.) and the equivalent °C.

Vulcascot Mini-Mounts

Vulcascot (Great Britain) Ltd., 87/89 Abbey Road, London, N.W.8, introduced Level-Mounts some three years ago. These rubber based machine mounts reduce vibration, simplify machine installation, ease the levelling of machines, reduce noise and make the drilling of floors unnecessary. A modification of the level-mount has now been introduced called the Mini-Mount, and is designed for small workshop machines, accountancy and other office machines, electronic instruments and other light machines. The rubber cushion on the Mini-Mounts can be moulded to any shape for special purposes and is made from Neoprene. This results in a cushion which is soft, oil, heat, abrasion and ozone resistant, is slow to age and does not lose its resilience under load.

Photo-Electric Counters

Perram fully transistorized photo-electric counters are manufactured by Tyer and Co. Ltd., Perram Works, Merrow Siding, Guildford, Surrey. The standard range is described in a recently published leaflet available from the above address.

High Speed Model HSC2/A is a six digit counter with reset, operating at 2,000 counts per minute. The HSC2/AA is a pre-selection counter equipped with relay and heavy duty contacts for batching control. This model is a four digit counter with facilities for batching from 1 to 10,000 and can operate at speeds up to 120 counts per minute. Battery portable counters are also available, pocket sized for counting small quantities at speeds of up to 20 per second. Types EL3/A and EL4/A.

Publications

Monofilament Extrusion

Monofilament extrusion with Tenite polypropylene is discussed in Technical Report No. 6, issued by Eastman Chemical Products Inc., Kingsport, Tennessee, USA.

The 16-page report examines the physical properties of polypropylene monofilament and describes the various steps involved in its production. Accompanying the report are schematic diagrams of a typical monofilament extrusion unit and a monofilament die.

Polysar Butyl Applications

Two applications for Polysar butyl rubber compounds are described in Technical Reports Nos. 61:6A and 61:6C issued by Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4.

No. 61:6A describes the compounding procedure and properties of butyl compounds suitable for wharf buffers. These are flexible shock absorbent fenders which prevent damage from impact and abrasion as a ship is being berthed, and while it is riding at its moorings. Advantages of butyl rubber for this application include its ability to absorb large amounts of kinetic energy and excellent weather, ozone and water resistance.

Report No. 61:6C describes a light-coloured Polysar Butyl 301 gasket compound developed for use on concrete sewer or water pipes. The gasket is designed to seal joints in concrete pipe sections and must have good compression set and low hardness. The excellent resistance of butyl rubber to water, bacteria and ageing, makes it particularly suitable for this application.

NEW COMPANIES

Marshtex (Plastics) Ltd. (698,917). July 20. Capital £200 in £1 shares. To carry on the business of manufacturers of, and dealers in, all kinds of plastics, etc. The first directors are to be appointed by the subscribers.

Map (Hardware and Plastic Sales) Ltd. (699,075). July 21. Capital: £500 in £1 shares. The first directors are not named.

Robinson Plastic Films Ltd. (699,164). July 24. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, bags, wrappers, reels, packages, and containers of all kinds of manufactured from or incorporating plastics films, etc. The first directors are to be appointed by the subscribers. Regd. office: 1 Redcliffe Street, Bristol, 1.

D. C. Sloper Ltd. (699,771). August 1. Capital: £15,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, products made of rubber and plastics, etc. The directors are: Donald C. Sloper and Avril D. Sloper, both of Hollymead, Ashley, Box, Wilts. Regd. office: Leafield, Corsham, Wilts.

R. and S. Plastics Ltd. (699,726). July 31. Capital: £100 in £1 shares. The directors are: Alexander Rafaeli, 12 Disraeli Street, Jerusalem, Israel; Alex Shapiro, 122 Pennine Drive, N.W.2. Regd. office: 2 The Spinney, Stanmore, Middlesex.

Hippocratic Plastics Ltd. (699,508). July 27. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, sterile articles for medical and surgical use, etc. Alfred Clark is the first director. Regd. office: 311b Rayners Lane, Pinner, Middlesex.

B.S.P. Plastics Ltd. (698,963). July 20. Capital: £1,000 in £1 shares. The directors are: Arthur W. J. Bridges, 530 Stratford Road, Shirley, Solihull; Harry Sessions, 27 Berkswell Road, Birmingham, 24; Frederick Peach and Brian L. Peach, both of 4 Mackenzie Road, Birmingham, 11. Regd. office: Facet Road, Birmingham, 30.

Increases of Capital

Plastic Ticket Co. Ltd. (505,433). Clumber Buildings, Clumber Street, Nottingham. Increased on December 6 1960, by £4,000 in £1 ordinary shares, beyond the registered capital of £1,030.

Bukit Mertajam Rubber Co. Ltd. (107,483), 69 Old Broad Street, E.C.2. Increased on December 7 1960, by £500,000 in 2s. ordinary shares, beyond the registered capital of £750,000.

Integral Plastics Ltd. (629,210), Princes Works, High Street, Bagshot. Increased on November 18 1960, by £4,200 in £1 ordinary shares, beyond the registered capital of £800.

J. H. Fenner and Co. (Holdings) Ltd. (329,377), Marfleet, Hull. Increased on January 4 1961, by £2,000,000 in 6,000,000 ordinary 5s. shares and 500,000 5½% cumulative preference £1 shares, beyond the registered capital of £1,000,000.

E. M. Cromwell and Co. Ltd. (481,347), manufacturers of, and dealers in, plastics, etc., Galloway Road, Rye Street, Bishop's Stortford. Increased on December 14 1960, by £5,000 in £1 ordinary shares, beyond the registered capital of £25,000.

Wheatley and Wood Ltd. (467,718), factors and distributors of giant commercial vehicle tyres, etc., 14/18 Queen Victoria Street, E.C.4. Increased on December 30 1960, by £17,500 in £1 ordinary shares, beyond the registered capital of £10,000.

CLASSIFIED ADVERTISEMENTS

RUBBER AND PLASTICS WEEKLY

APPOINTMENTS VACANT

6d. a word, Minimum 12/6 Box 2/-

APPLICATIONS are invited from highly qualified university trained mechanical engineers with good experience in the design of rubber components. A good knowledge of rubber technology with special design applications for the engineering field. The position offers a lot of scope with a very progressive specialised rubber company in South Africa.—Please write in confidence giving full details of training, age, marital status, education and salary required to the Managing Director, 12 Ashley Place, Victoria Street, Westminster, London, S.W.1. (470)

APPLICATIONS are invited for the position foreman extrusion department of a rubber company in Surrey. Pension and bonus schemes in operation.—Write in confidence, giving full details of age, experience and present salary to Box 445. (445)

ASSISTANT chief chemist. A qualified chemist/rubber technologist required with knowledge of the compounding of synthetic rubbers, experience of plastics technology an advantage. The Company manufactures flexible aircraft fuel tanks, specialised rubber mouldings and a range of commercial containers.—Please write giving details of age, education, experience, salary, etc. Personnel Manager, Fireproof Tanks Limited, The Airport, Portsmouth, Hants. (465)

DESIGNER required for rubber and plastic connector field, capable of following job from customer's enquiry to production.—Full details to Reliance Cords and Cables Ltd., Staffa Road, Leyton, E.10. (450)

DUE to considerable expansion of sponge department an experienced chemist and a technician are required to assist in development and control. Good welfare schemes and conditions.—Apply stating experience and salary required to Box 462. (462)

LABORATORY assistant (male or female) required. Age 16/18. 'A' or 'O' level G.C.E. Previous laboratory experience preferred but not essential. Salary to commence £5 15s. to £7 15s. per week, according to experience.—Apply to Works Director, C. E. Heinke and Co. Ltd., 87 Grange Road, Bermondsey, S.E.1. Phone: BERmondsey 4461/4. (466)

APPOINTMENTS VACANT

(continued)

SPONGE chemist for development work and sponge technician for factory control required by expanding company in East Midlands. Pension scheme. Good conditions.—Write stating experience and salary required to Box 461. (461)

BTR

at

LEYLAND, LANCS.

require

PHYSICISTS, ENGINEERS or RUBBER SCIENTISTS

To work on technical control and/or development work on

CONVEYOR BELTING (ref. LCB) and other rubber or plastic products connected with conveyor systems.

HOSE (ref. LH)—High pressure, textile or hand made for all purposes.

RESEARCH AND DEVELOPMENT (ref. LRD)—rubber and plastics testing and research, yarn or textile research, etc., in widest product range.

Candidates may be graduates, Inst. Physics, ARIC, AMI Mech.E, AIRI, API, etc., although men with less academic qualification but appreciable experience may fulfil certain requirements.

Good salaries and prospects, with pension scheme and life assurance.

Tabulated career details to:

Central Personnel Department,

BTR INDUSTRIES LTD

Herga House,
Vincent Square,
London, S.W.1.

(464)

APPOINTMENTS VACANT

(continued)

DUNLOP Rubber Co. Ltd., has a vacancy on the permanent technical staff for an experienced rubber technologist for process control work in the mill and compounding department. Age 25 to 35. Applicant should have had at least five years' experience in the rubber industry and hold a minimum qualification of LIRI standard. This is a responsible position offering good prospects for advancement to the right type of applicant. Salary will be commensurate with ability, experience and qualifications.—Reply stating age and full details of experience to Technical Personnel Manager, Dunlop Rubber Co. Ltd., Cambridge Street, Manchester. (453)

MILLROOM foreman required, experienced in mixing and calendering. Must have ability to instruct millroom operators in these processes. Good salary and prospects. As the company is moving to a new factory at Ashford in Kent within 18 months, applicants must be willing to move with the company. Modern housing will be available.—Apply by letter to C. E. Heinke and Co. Ltd., 87 Grange Road, London, S.E.1. (467)

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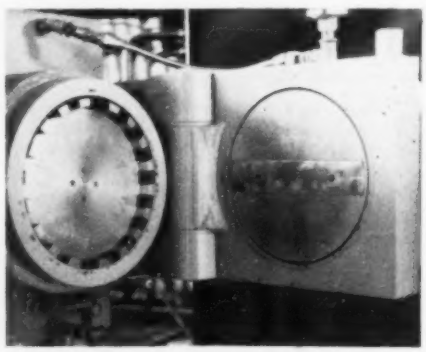

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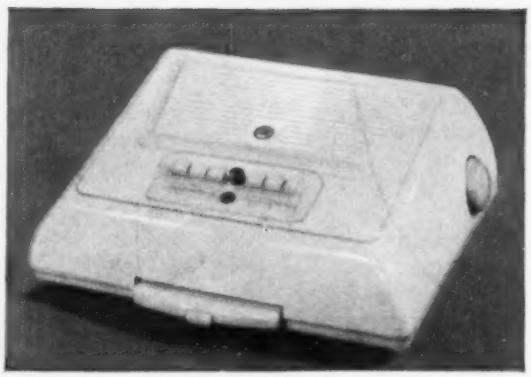

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